

**Fostex**

PORTABLE DIGITAL AUDIO RECORDER

**PD-2**

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**Owner's Manual**



### CAUTION

RISK OF ELECTRIC SHOCK  
DO NOT OPEN



CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,  
DO NOT REMOVE COVER(OR BACK).  
NO USER-SERVICEABLE PARTS INSIDE.  
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

### CAUTION:

TO PREVENT ELECTRIC SHOCK, MATCH  
WIDE BLADE OF PLUG TO WIDE SLOT,  
FULLY INSERT.

### ATTENTION:

POUR ÉVITER LES CHOCs ÉLECTRIQUES,  
INTRODUIRE LA LAME LA PLUS LARGE  
DE LA FICHE DANS LA BORNE CORRE-  
SPONDANTE DE LA PRISE ET POUSSER  
JUSQU'AU FOND.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

## "WARNING"

"TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK,  
DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOIS-  
TURE."

## SAFETY INSTRUCTIONS

1. Read Instructions — All the safety and operating instructions should be read before the appliance is operated.
2. Retain Instructions — The safety and operating instructions should be retained for future reference.
3. Heed Warnings — All warnings on the appliance and in the operating instructions should be adhered to.
4. Follow Instructions — All operating and use instructions should be followed.
5. Water and Moisture — The appliance should not be used near water — for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, and the like.
6. Carts and Stands — The appliance should be used only with a cart or stand that is recommended by the manufacturer.
7. Wall or Ceiling Mounting — The appliance should be mounted to a wall or ceiling only as recommended by the manufacturer.
8. Ventilation — The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
9. Heat — The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.
10. Power Sources — The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
11. Grounding or Polarization — The precautions that should be taken so that the grounding or polarization means of an appliance is not defeated.
12. Power Cord Protection — Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
13. Cleaning — The appliance should be cleaned only as recommended by the manufacturer.
14. Nonuse Periods — The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.
15. Object and Liquid Entry — Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
16. Damage Requiring Service — The appliance should be serviced by qualified service personnel when:
  - A. The power supply cord or the plug has been damaged; or
  - B. Objects have fallen, or liquid has been spilled into the appliance; or
  - C. The appliance has been exposed to rain; or
  - D. The appliance does not appear to operate normally or exhibits a marked change in performance; or
  - E. The appliance has been dropped, or the enclosure damaged.
17. Servicing — The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.



An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.

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# 1 Safety, Warnings & Installation

## Safety

Make sure the PD-2's power cord is not located in a position where it is likely to be walked on and/or pinched by other equipment placed near the cord.

Do not expose the PD-2 to extremes of humidity.

Do not place the PD-2 in direct sunlight, close to heating units or areas subject to high temperatures.

Operating environment temperature should be between 0° - 45°C .

Do not place the PD-2 in areas subject to extremely low temperatures.

Do not place the PD-2 in locations subject to excessive dust.

Do not place the PD-2 in an area subject to excessive vibration.

Do not expose the PD-2 to excessive shocks.

## Warnings

Use only the optional AD-15 power supply adaptor with the PD-2.

If the voltage of the external power supply exceeds the following limits, serious damage may occur to the PD-2.

Power on: >16V

Power off: >18V

Do not attempt to charge alkali type batteries.

To reduce the risk of electric shock, do not open the PD-2.

To reduce the risk of fire or electric shock, do not expose the PD-2 to excessive rain or moisture.

The PD-2 contains no user serviceable parts. Refer all servicing to qualified personnel.

The liquid inside the LCD is harmful. If the LCD is broken, do not taste or swallow the liquid that has escaped. Avoid any skin contact with the liquid. If some liquid is spilled onto your skin, wash it off immediately.

If any of the following should occur, the PD-2 should be serviced by qualified personnel:

Metal objects or liquids get inside the PD-2.

The PD-2 is exposed to excessive rain.

The PD-2 is dropped and/or the enclosure is damaged.

The PD-2 does not operate normally, or a marked change in performance is noticed.

## Waterproofing

The front and top panels have been designed to offer a reasonable amount of protection from rain and water. However, the construction is not up to commercial waterproofing standards. So, please use common sense rules when operating the PD-2 in a wet environment. A soft case is available as an optional extra.

## Condensation and the internal heater

If the PD-2 is moved from a cold environment to a warm environment, condensation may build up on the tape transport. Condensation may also occur if the PD-2 is used in a damp environment. To prevent possible damage to the transport and DAT cassette, a dew sensor will automatically stop transport operations according to the previous set mode. The PD-2 has an internal heater to evaporate any moisture that may gather inside. If dewing occurs, the word "DEW" will appear in the LCD, and depending on the previous set mode parameters regarding this function, the heater will automatically switch on, and the word "HEAT" will be displayed on the LCD.



When the dew has been cleared, the heater will switch off and the words "DEW" and "HEAT" will disappear from the LCD. The PD-2 will then be ready for use.

The HEAT key can be used as follows.

- 1) The heater may be manually switched on/off only with HEAT key. This may be done only when the internal sensor has not detected dew (when "DEW" is not lit or blinking).
  - ① Press the HEAT key to switch on the heater. "HEAT" will be lit in the display.
  - ② Press the HEAT key again to turn off the heater. The "HEAT" display will be extinguished if the internal sensor does not detect dew.
- 2) When the dew sensor detects moisture collecting ("DEW" is lit or blinking), the heater automatically switches on and "HEAT" is displayed. At this time, the heater may not be switched off manually.

The heater is thermostatically controlled, so leaving it switched on for a long period of time will not cause any damage. However, the heater increases the power consumption, so, bare in mind the remaining capacity of the battery.

**NOTE:** Please bear in mind that the PD-2's dew sensor cannot detect condensation on the surface of a tape.

## Memory back-up battery

As well as the main battery, the PD-2 contains a memory back-up battery. This battery protects the memory data while the main battery is being replaced. The back-up battery is automatically charged when the PD-2 is powered up.

During periods of non use, memory data will be maintained for three months, at room temperature. After this time, the memory will reset to the factory default settings. The internal clock will reset to 0 hour: 0 minute: 0 second.

To maintain the memory data, power up the PD-2 for 24 hours at least once every two months. A fully discharged battery requires 24 to 48 hours of charging.

**NOTE:** It is possible that the back-up battery may be in a discharged state when you purchase the PD-2, therefore the above charging method should be performed before using the PD-2.

The back-up battery is a Vanadium-Lithium type. The battery will normally last for about five years. When you need to replace the back-up battery, see your dealer, or service centre.

## Cylinder drum (head) cleaning

The cylinder drum requires periodic cleaning, to remove deposits of tape oxide. This can be carried out using a quality DAT cleaning cassette, available from your DAT dealer. DAT cleaning cassettes, conforming to the IEC standard, have an ID hole that is detected by the PD-2.

Follow the instructions enclosed with the DAT cleaning cassette.

**NOTE:** If the cylinder drum is regularly subjected to condensation, for long periods of time, surface rust may occur. If surface-rust occurs you must not use a DAT cleaning cassette. This would only powder the rust, the powder would then become stuck in the head gap.

## General cleaning

The outer case of the PD-2 should be cleaned using a soft, lightly moistened cloth. Stubborn marks can be removed using a mild detergent.

**NOTE:** Do not use abrasive cleaners or solvent based cleaning fluids, such as alcohol and benzine.

## Installation

The PD-2 packaging should contain the following items:

1	PD-2 DAT recorder
1	Carrying belt
1	Owner's manual

Optional items sold separately:

1	AD15 power supply adaptor
1	Soft case

The PD-2 has been designed to withstand the most demanding on-the-road applications and a rugged construction has been used throughout. However, you should use the same common sense handling techniques as you would for any piece of portable electronic equipment. It is recommended that the PD-2 be used either vertically or horizontally.

When recording on-location, make use of the softcase. When using the carrying strap, make sure it is securely fitted to the PD-2.

## DAT standards applied to the PD-2

The DAT standard, as approved by the IEC (International Electrotechnical Commission), consists of the following six parts.

- Part 1. Dimensions and characteristics
- Part 2. DAT calibration tape
- Part 3. DAT tape properties
- Part 4. Methods of measurement for DAT recorder
- Part 5. DAT for professional use
- Part 6. SCMS for consumer audio use DAT recorders

The PD-2 conforms to parts 1, 2, 3, 4, and 5.

The PD-2 is a professional DAT Recorder, so part 6 does not apply. Part 6 is for consumer type DAT equipment.

## Digital audio interface standard

The serial self-clocking PCM audio transmission format used by the PD-2's digital input and output connections falls into two categories:

- 1) AES/EBU (Broadcasting studio use in the IEC 958 standard)
- 2) Consumer use (SPDIF) in the IEC 958 standard

## TC format

Fostex were the first manufacturer to incorporate timecode facilities on a DAT Recorder, namely the D-20. The timecode recording format was developed by Fostex, and made use of the sub-code area. Recently the timecode recording format for DAT was standardized by the IEC. The PD-2 and D-20 can record and playback timecode using either the FOSTEX or the IEC timecode format.

## 2 Introduction

### Welcome

Thank you for purchasing the PD-2 Portable DAT Recorder. The PD-2 has been primarily designed for film, video and TV location work, the requirements being: two high quality audio channels, the ability to record SMPTE/EBU timecode and portability. The PD-2 recorder fulfils all these requirements. Further more, the compact size of DAT cassettes and the ability to record two hours of 16-bit digital audio on one cassette make the PD-2 the perfect replacement for existing portable 1/4" analog recorders. Also, the increased importance of audio for video and the introduction of NICAM digital stereo broadcasts, further strengthens the need for a high-quality alternative to analog 1/4" .

FOSTEX are certainly not newcomers to the DAT market. Their highly successful D-20 DAT Recorder is currently used by professional sound and broadcast people throughout the world. While other DAT manufactures waited for a DAT timecode standard to be adopted, FOSTEX included timecode on their D-20 DAT recorder, making it an instant success with professionals.

Recently the IEC (International Electrotechnical Commission) published details of the timecode standard for DAT recording. Following FOSTEX's tradition of supporting all customers, the PD-2 can use both IEC timecode and FOSTEX timecode.

During location recording, for film, video or TV, the camera and audio recorder must share the same timecode source. Obviously, this restricts the movement of both the camera operator and the sound technician, who must always move around as a team. The PD-2 gives you freedom, once you have started recording timecode, the JAM function allows you to disconnect the external timecode source and let the PD-2's internal timecode generator continue striping the DAT cassette.

Like all FOSTEX equipment, the PD-2 has been designed and built to meet the exacting requirements demanded by today's sound professional. The PD-2 will give you outstanding performance, whatever your creative application.

### PD-2 Features

- ☐ Two 16-bit digital audio channels.
- ☐ Record and playback of SMPTE/EBU timecode, by using IEC and FOSTEX formats. Both IEC and FOSTEX formats can be recorded at the same time.
- ☐ Compatibility with all DAT recorders.
- ☐ Four head design allows off tape " confidence " monitoring while recording.
- ☐ Sampling frequencies: 48kHz, 44.1kHz and 44.056kHz.
- ☐ Digital transfer of data using either consumer (SP DIF) or professional (AES/EBU) of IEC 958.
- ☐ External synchronization: PCM audio wordclock or composite-, field- or frame-video signal and DAT frame.
- ☐ Slate using either a 1kHz tone or the internal microphone.
- ☐ Comprehensive analog input facilities include: balanced microphone and line. For microphone input: phantom power, phase reverse, pad switch, response filters and limiter.
- ☐ Headphone monitoring options include a Plus-and-Minus matrix for use with MS microphone recording techniques.

- ☐ Compatible with DAT cassettes recorded on all DAT recorders.
- ☐ Record and location of START and END IDs.
- ☐ Search and locate to either Timecode, A-TIME or PNOs.
- ☐ Record and search for error markers.
- ☐ An internal monitor speaker.
- ☐ All controls are recessed to prevent accidental operation. Positive action switches and keys have been used throughout.
- ☐ Rugged, portable construction.

## Applications

Although the PD-2 has been designed primarily for location recording, virtually any application demanding DAT recording can make use of the PD-2. Some applications are listed below. See "Typical System Configurations", on page 70, for more detailed applications.

- ☐ A direct replacement for existing 1/4" analog recorders.
- ☐ Location recording for film.
- ☐ ENG (Electronic News Gathering).
- ☐ EFP (Electronic field Production).
- ☐ A stand-alone professional DAT recorder with timecode.
- ☐ Stereo recording using AB, XY and MS microphone techniques.
- ☐ Back-up of DAT cassettes using the digital inputs and outputs.

## Using this manual

As you are probably already familiar with DAT principles, we will start the PD-2 operating instructions straightaway. The following abbreviations have been used throughout this manual:

TC - Timecode

A-TIME - Absolute Time

PNO - Program Number

INT - Internal

EXT - External

SW - Switch

Fs - Sampling Frequency

Field, when talking about the LCD display, refers to a particular area on the LCD.

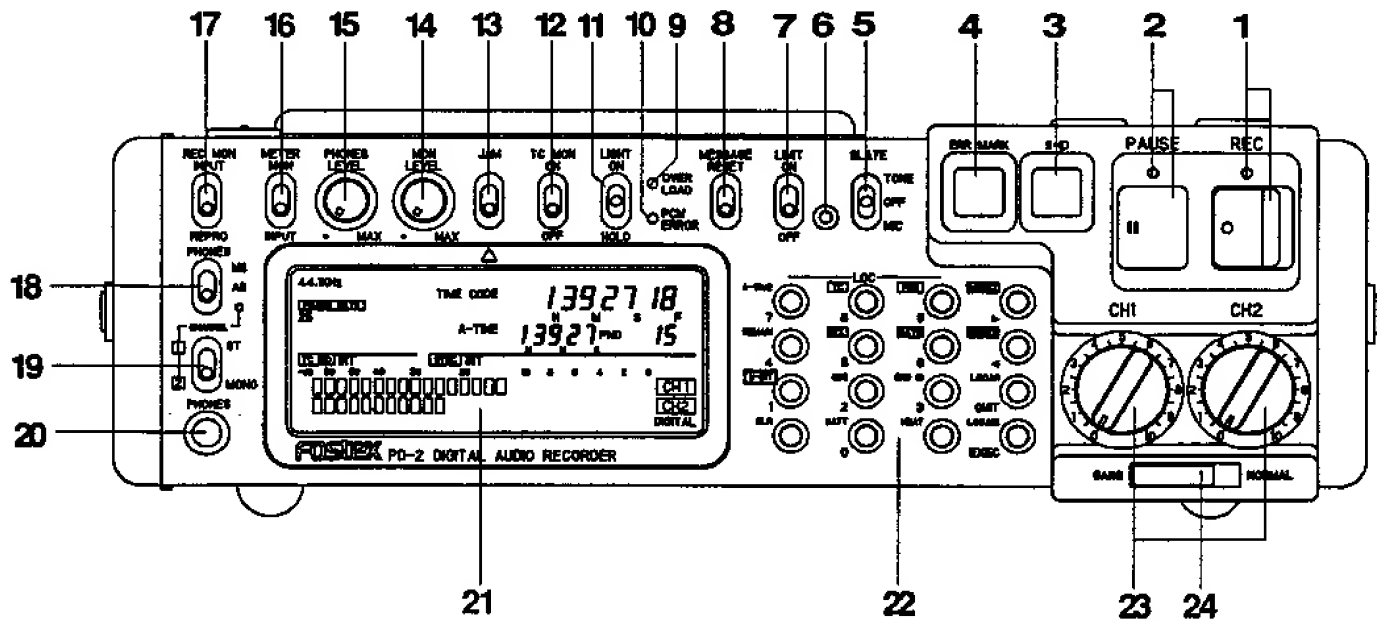
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### Further Reference

- 1) *"Audio Design"*, Tony Zaza, Prentice Hall, 1991.
- 2) *"The Art of Digital Audio"*, John Watkinson, Focal Press (Butterworth Group), 1988, 1989.
- 3) *"Coding for Digital Recording"*, John Watkinson, Focal Press (Butterworth Group), 1990.
- 4) *"Audio Engineering Handbook"*, K.Blair Benson, McGraw-Hill, 1988.

### 3 Front, Top & Side Panel Features

#### Front panel layout



- |                       |                                    |
|-----------------------|------------------------------------|
| [1] REC key/LED       | [13] JAM SW                        |
| [2] REC PAUSE key/LED | [14] MON LEVEL                     |
| [3] S-ID key          | [15] PHONES LEVEL                  |
| [4] ERROR MARK key    | [16] METER SW                      |
| [5] SLATE SW          | [17] REC MON SW                    |
| [6] SLATE MICROPHONE  | [18] PHONES MODE SW                |
| [7] LIMIT SW          | [19] PHONES ST/MONO SW             |
| [8] MESSAGE RESET SW  | [20] PHONES JACK                   |
| [9] OVER LOAD LED     | [21] LCD                           |
| [10] PCM ERROR LED    | [22] Function keys                 |
| [11] LIGHT SW         | [23] CH1 CH2 Record level controls |
| [12] TC MONITOR SW    | [24] GANG/NORMAL lever             |

## Front panel description

- [1]    **REC key/LED**  
Start recording. The LED illuminates during recording. Used in combination with the CLR key, allows record muting.
- [2]    **REC PAUSE key/LED**  
Pause recording. The LED illuminates while in pause mode.
- [3]    **S-ID key**  
Record a START ID while recording.
- [4]    **ERROR MARK key**  
Record an ERROR MARK while recording.
- [5]    **SLATE SW**  
Record a 1kHz slate tone, or the sound picked up by the internal microphone on both audio channels.
- [6]    **SLATE MICROPHONE**  
A condenser type microphone.
- [7]    **LIMIT SW**  
Switches the internal limiter on/off when the input selector is set to MIC.
- [8]    **MESSAGE RESET SW**  
Clear the error message currently shown on the LCD.
- [9]    **OVER LOAD LED**  
Illuminates when the microphone or Line signal is clipped (CH1 and CH2).
- [10]   **PCM ERROR LED**  
Lights green when the BER (block error rate) is greater than 1% and red when the BER is greater than 10%.
- [11]   **LIGHT SW**  
Switch on the internal lights, for viewing the cylinder drum, and the LCD side light.
- [12]   **TC MONITOR SW**  
Monitor the TC using the internal speaker and headphones.
- [13]   **JAM SW**  
Synchronise the PD-2's internal TC generator with the external TC source, allowing you to disconnect the external TC and let the PD-2's internal TC generator continue striping the tape (free-run mode).
- [14]   **MONITOR LEVEL**  
Adjust the volume of the monitor speaker.
- [15]   **PHONES LEVEL**  
Adjust the volume of the headphones.
- [16]   **METER SW**  
Select the source for the LCD bargraphs: INPUT or follow the REC MON SW.

**[17] REC MON SW**

Select the monitor source: INPUT or REPRO. During recording REPRO allows off tape "confidence" monitoring.

**[18] PHONES MODE SW**

Select the headphones mode: MONO/STEREO, LEFT only/RIGHT only, MS mono/MS stereo.

**[19] PHONES ST/MONO**

Used in conjunction with the PHONES MODE SW.

**[20] PHONES JACK**

Headphone connection: 6.35mm stereo jack.

**[21] DISPLAY**

By employment of a side lighted large LCD display, operation of each section are centralized in this display.

**[22] Function key area**

Various locate keys and control keys for time editing are located here.

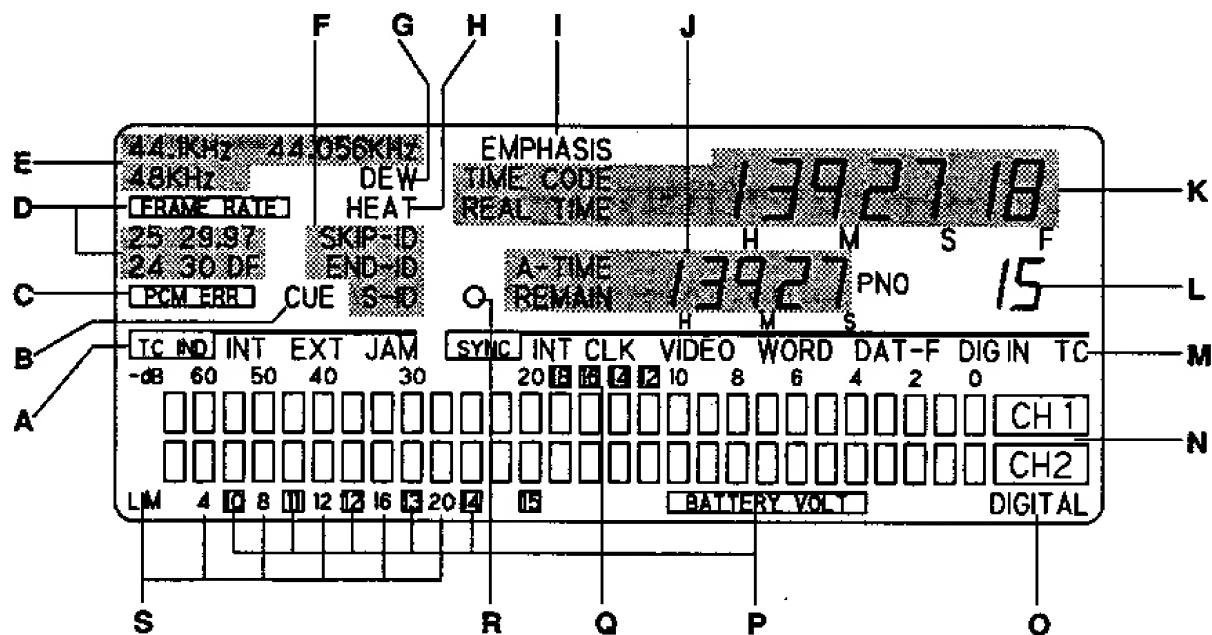
**[23] CH1 CH2 Record level controls**

Adjust the level of signal recorded on to tape.

**[24] GANG/NORMAL LEVER**

Gang the record level controls together, or normal allows independent channel record level setting.

## LCD



- |                                 |                             |
|---------------------------------|-----------------------------|
| [A] TC mode indicator           | [K] TIMECODE field          |
| [B] CUE mode indicator          | [L] PNO field               |
| [C] PCM ERROR indicator         | [M] SYNC mode indicator     |
| [D] FRAME RATE indicator        | [N] Bargraph level meters   |
| [E] SAMPLING FREQ indicator     | [O] DIGITAL INPUT indicator |
| [F] SKIP-, END-, S-ID indicator | [P] BATTERY VOLTAGE         |
| [G] DEW indicator               | [Q] REFERENCE LEVEL marker  |
| [H] HEATER indicator            | [R] ERROR MARK indicator    |
| [I] EMPHASIS indicator          | [S] LIMITER indicator       |
| [J] A-TIME field                |                             |

**[A] TC mode Indicator**

Indicates the TC source: INT, EXT, or JAM operation.

**[B] CUE mode Indicator**

Indicates that CUE mode is on.

**[C] PCM ERROR Indicator**

Flashes when a PCM error occurs.

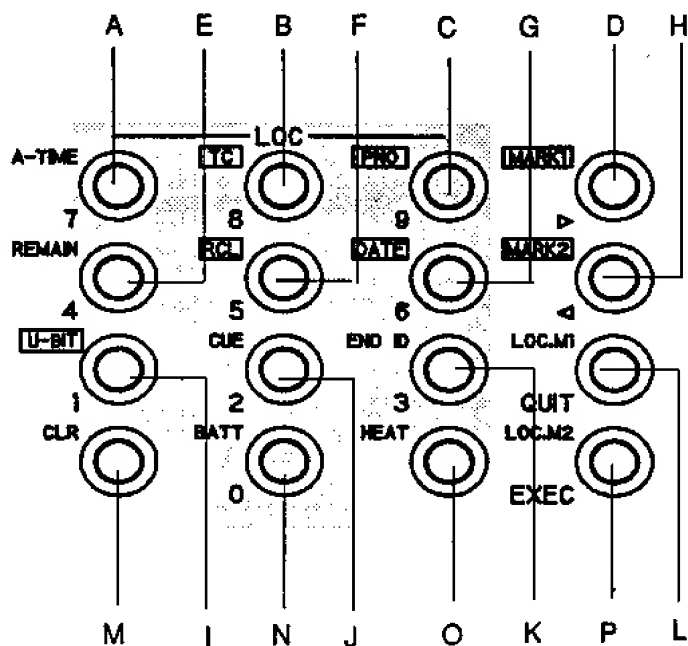
**[D] FRAME RATE Indicator**

Indicates the currently selected TC frame rate. Flashes when the EXT TC being input is at a different frame rate to that currently set on the PD-2.



- [E] SAMPLING FREQ Indicator**  
Indicates the currently set sampling frequency. Flashes when the sampling frequency of a digital input signal, or a prerecorded tape is different to that currently set on the PD-2.
- [F] SKIP-, END-, S-ID Indicator**  
Indicate the type of ID marker that is recorded, or being recorded on tape.
- [G] DEW Indicator**  
Indicates that dew has been detected on the tape transport.
- [H] HEATER Indicator**  
Indicates that the internal heater is on.
- [I] EMPHASIS Indicator**  
Indicates that the EMPHASIS SW is on. If the EMPHASIS switch is set to off, but the tape currently being played was recorded with emphasis, this indicator will flash.
- [J] A-TIME field**  
Displays the A-TIME.
- [K] TIMECODE field**  
Displays the TC value.
- [L] PNO field**  
Shows the current PNO.
- [M] SYNC mode Indicator**  
Indicates the current SYNC mode: INT CLK, VIDEO, WORD, DAT-F, DIG IN or TC.
- [N] Bargraph level meters**  
While recording these meters show the level of the signal being recorded to tape. During playback they show the signal level recorded on the tape.
- [O] DIGITAL INPUT Indicator**  
Indicates that a digital input signal corresponding to the consumer (SPDIF) or professional (AES/EBU) of IEC 958 is connected at the DIGITAL IN connector.
- [P] BATTERY VOLTAGE**  
Shows when the battery check function is being used.
- [Q] REFERENCE LEVEL marker**  
Shows the current setting of the reference level marker.
- [R] ERROR MARK Indicator**  
Indicates that an ERROR MARK has been recorded onto tape.
- [S] LIMITER Indicator**  
Indicates that the limiter is currently on.

## Function keys



[A] A-TIME LOCATE key

[B] TC LOCATE key

[C] PNO LOCATE key

[D] MARK 1 / ▷ key

[E] TAPE REMAIN key

[F] RCL key

[G] DATE DISPLAY key

[H] MARK 2 / ◁ key

[I] U-BIT key

[J] CUE key

[K] END-ID REC key

[L] LOC-M1/QUIT key

[M] CLR key

[N] BATTERY CHECK key

[O] HEATER key

[P] LOC-M2/EXECUTE key

### [A] A-TIME LOCATE key

Enter an A-TIME value that is to be used for locating.

### [B] TC LOCATE key

Enter a TC value that is to be used for locating.

### [C] PNO LOCATE key

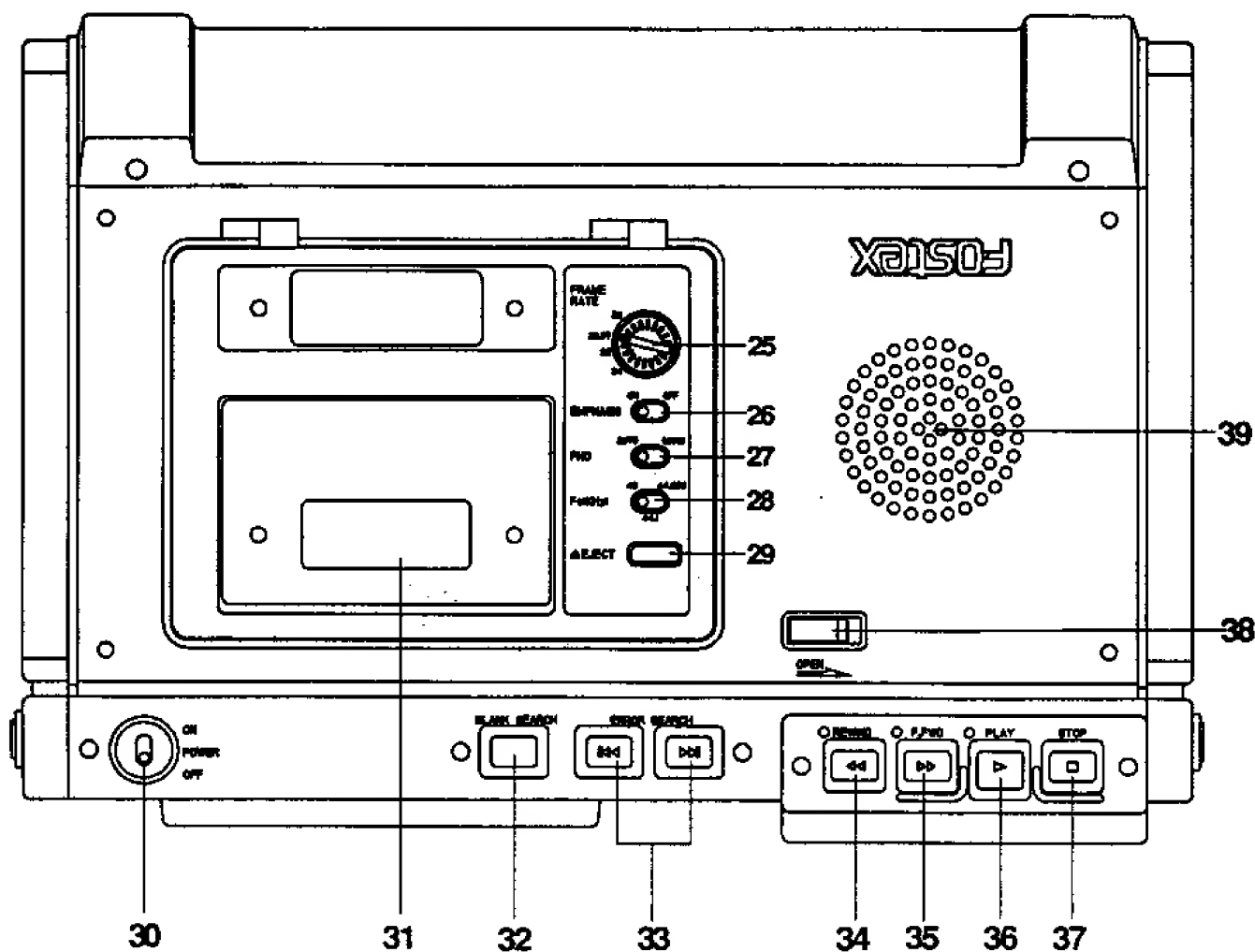
Enter an PNO that is to be used for locating.

### [D] MARK 1 / ▷ key

Store the current A-TIME value in memory as MARK 1. Also used as the right cursor key when entering or editing numeric values.

- [E] TAPE REMAIN key**  
Show the remaining time on tape.
- [F] RCL key**  
Set the real time clock, TC generator start time, PNO starting number and edit MARK 1 & 2.
- [G] DATE DISPLAY key**  
Display the current date and time. When playing a tape, the date information recorded in the sub code will be displayed.
- [H] MARK 2 / ◀ key**  
Store the current A-TIME value in memory as MARK 2. Also used as the left cursor key when entering or editing numeric values.
- [I] U-BIT key**  
This will display the TC U-Bit data which is recorded on the tape in the TC field.
- [J] CUE key**  
Cue mode: monitor off tape during F.FWD and REWIND.
- [K] END-ID REC key**  
Record an END ID while recording.
- [L] LOC-M1 / QUIT key**  
Locate to the MARK 1 A-TIME value. Also used as the QUIT key when using the soft functions.
- [M] CLR key**  
Reset the linear tape counter, set numeric values to zero when in edit mode, and reset the peak hold function when using manual reset mode.
- [N] BATTERY CHECK key**  
Check the battery voltage under any load condition.
- [O] HEATER key**  
Pre-heat the cylinder drum to prevent dewing.
- [P] LOC-M2 / EXECUTE key**  
Locate to the MARK 2 A-TIME value. Also used as the EXECUTE key when using the soft functions.

## Top panel layout



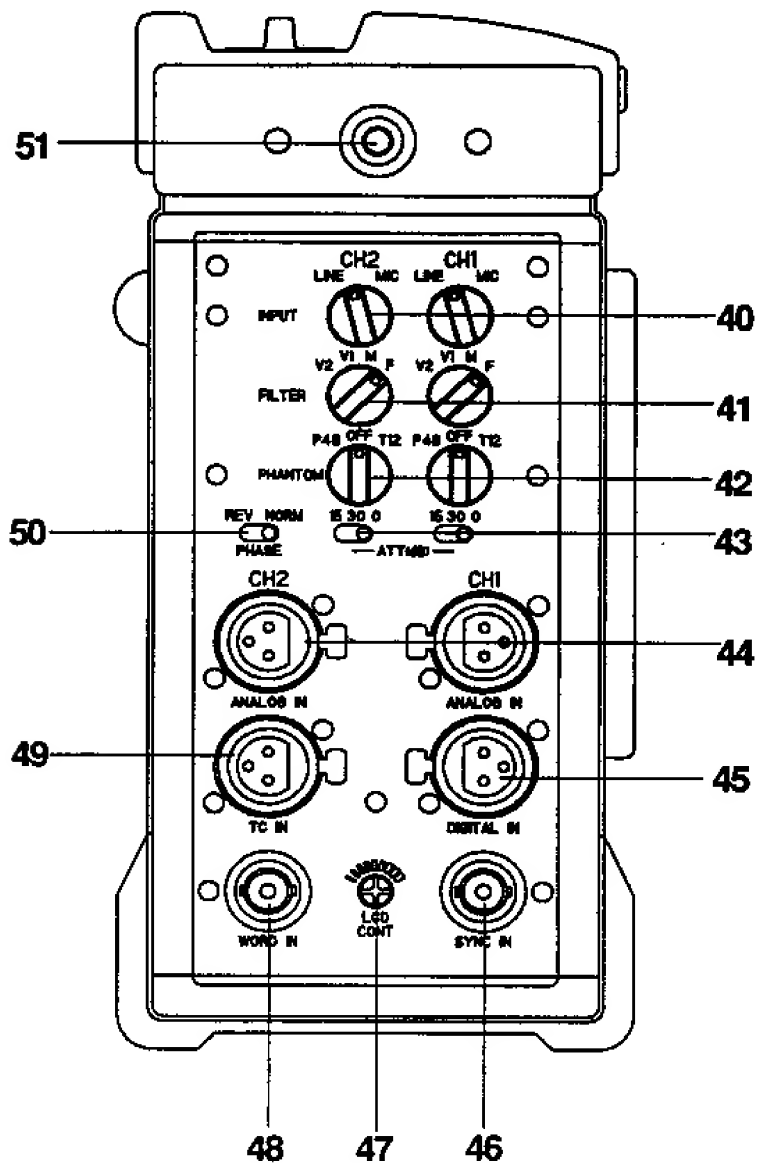
- [25] FRAME RATE selector
- [26] EMPHASIS SW
- [27] PNO SW
- [28] Fs SELECT SW
- [29] EJECT key
- [30] POWER SW
- [31] Tape transport and cover
- [32] BLANK SEARCH key

- [33] ERROR SEARCH keys
- [34] REWIND key/LED
- [35] F.FWD key/LED
- [36] PLAY key/LED
- [37] STOP key
- [38] Protective cover OPEN lever
- [39] MONITOR SPEAKER

## Top panel description

- [25] FRAME RATE selector**  
Set the TC frame rate of the INT TC generator.
- [26] EMPHASIS SW**  
Record an analog source with emphasis.
- [27] PNO SW**  
Record program numbers either MANUALLY by pressing the S-ID key, or AUTOMATICALLY when recording is started.
- [28] Fs SELECT SW**  
Set the sampling frequency for analog and digital recording.
- [29] EJECT key**  
Eject the cassette.
- [30] POWER SW**  
Switch on the power.
- [31] Tape transport and cover**  
Tape insertion slot and protective cover.
- [32] BLANK SEARCH key**  
Search for an END ID, or if there is no END ID, the blank section of tape after the last recording.
- [33] ERROR SEARCH keys**  
Search for ERROR MARKS.
- [34] REWIND key**  
Start rewind mode. Press once for slow (x5), or twice for fast (x100). Repeated pressing will toggle between slow and fast rewind.
- [35] F.FWD key**  
Start fast forward mode. Press once for slow (x5), or twice for fast (x100). Repeated pressing will toggle between slow and fast forward.
- [36] PLAY key**  
Start play mode.
- [37] STOP key**  
Stop all tape transport modes. Press once for pause mode and twice for stop mode. Repeated pressing will toggle between pause and stop mode.
- [38] Protective cover open lever**  
Open the protective cover.
- [39] MONITOR SPEAKER**  
Internal speaker used for monitoring.

# Right side panel layout (inputs)



[40] INPUT SW

[41] FILTER SW

[42] PHANTOM SW

[43] ATT SW

[44] ANALOG IN

[45] DIGITAL IN

[46] SYNC IN

[47] LCD CONTRAST

[48] WORD SYNC IN

[49] TC INPUT

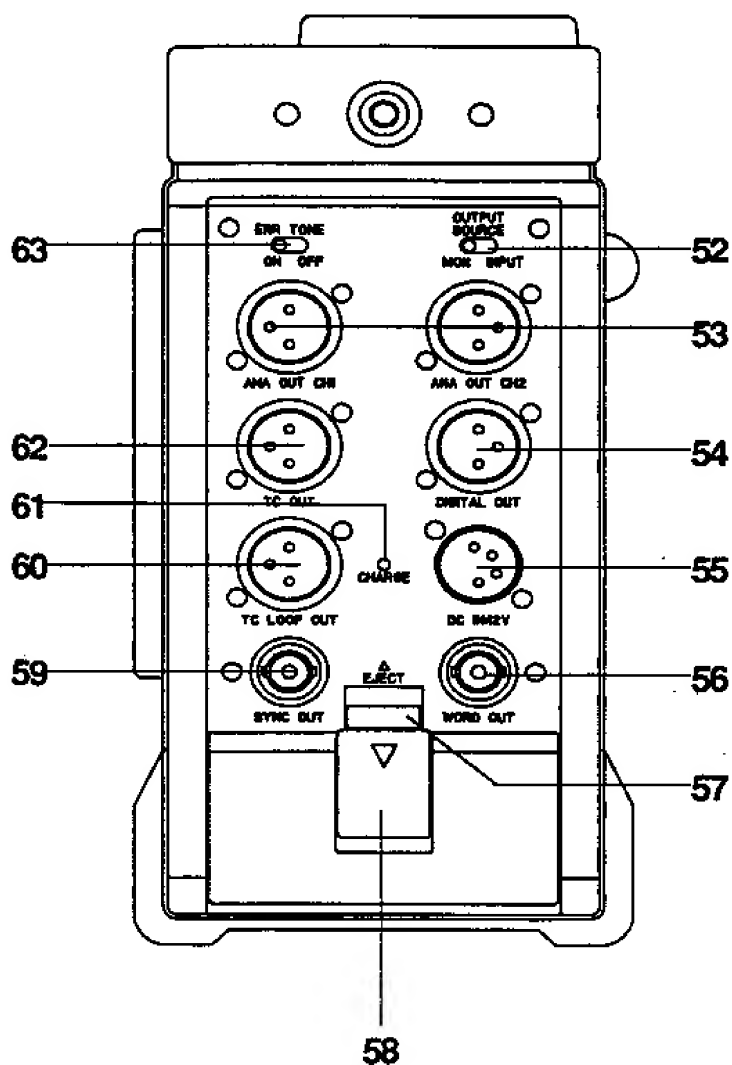
[50] PHASE SW (CH 2)

[51] Shoulder strap fixing stud

## Right side panel description

- [40] INPUT SW**  
Select Microphone or line for analog recording.
- [41] FILTER SW**  
Select a filter type for microphone recording.
- [42] PHANTOM SW**  
Phantom powering for condenser type microphones.
- [43] ATT SW**  
Input gain attenuator for microphone recording.
- [44] ANALOG IN**  
Balanced analog input signal connection.
- [45] DIGITAL IN**  
Digital input connection for AES/EBU professional and consumer (SP DIF) formats.
- [46] SYNC IN**  
Synchronising-video, or DAT frame input connection.
- [47] LCD CONTRAST**  
Adjust the contrast of the LCD display.
- [48] WORD SYNC IN**  
Synchronizing-wordclock input connection.
- [49] TC INPUT**  
Balanced external TC input connection.
- [50] PHASE SW (CH 2)**  
Reverse the phase of CH 2 microphone input.
- [51] Shoulder strap fixing stud**  
Shoulder strap fixing point.

## Left side panel layout (outputs)



[52] OUTPUT SOURCE

[53] ANALOG OUT

[54] DIGITAL OUT

[55] EXT POWER

[56] WORD SYNC OUT

[57] BATTERY EJECT lever

[58] BATTERY DOOR open button

[59] SYNC OUT

[60] TC LOOP OUT

[61] CHARGE INDICATOR

[62] TC OUTPUT

[63] ERROR TONE SW



## Left side panel description

**[52] ANALOG OUTPUT SOURCE**

Set the output source to INPUT or MON (follow the monitor).

**[53] ANALOG OUT**

Balanced analog output signal connection.

**[54] DIGITAL OUT**

Digital output connection for AES/EBU professional and consumer formats.

**[55] EXT POWER**

External power supply connection.

**[56] WORD SYNC OUT**

Wordclock output connection.

**[57] BATTERY EJECT lever**

For removing the Ni-Cd battery.

**[58] BATTERY DOOR open button**

Open the door of the battery compartment.

**[59] SYNC OUT**

Video-frame sync pulse output connection. If DAT frame sync is being applied to the EXT SYNC IN connector, DAT frame sync will be output.

**[60] TC LOOP OUT**

Balanced output of TC applied at the TC INPUT connection.

**[61] CHARGE INDICATOR**

Lights red during normal charging, and green during trickle charging.

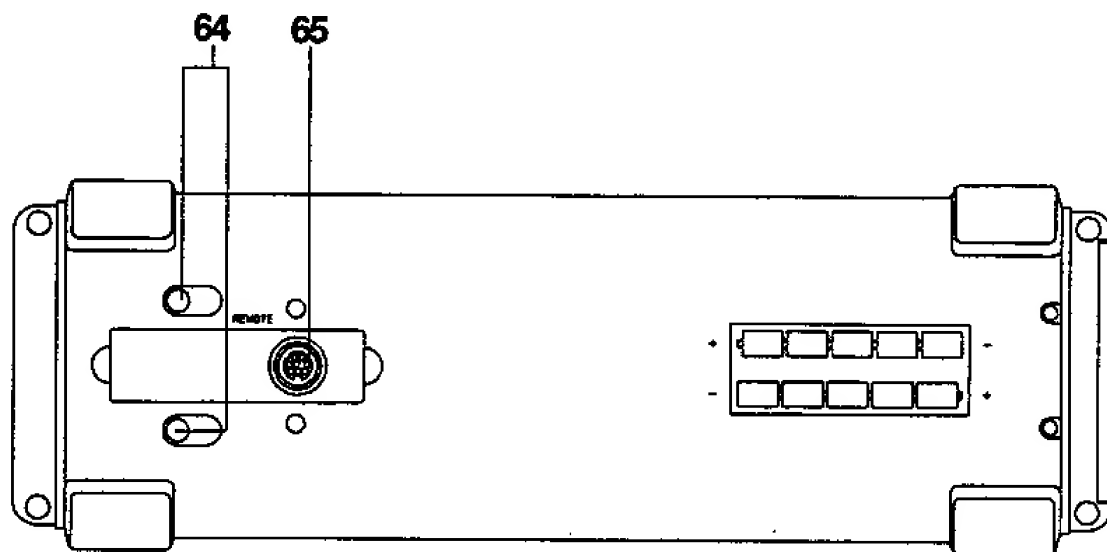
**[62] TC OUTPUT**

Balanced TC output connection.

**[63] ALARM TONE SW**

Sound a 1kHz error tone in the following situations: PCM error, input amplifier clipping and battery low charge condition.

## Rear panel



[64] BATTERY ADJUSTING SCREWS

[65] CONTROLLER

## Rear panel description

[64] BATTERY ADJUSTING SCREWS

[65] CONTROLLER

Please refer to page 72 for more information.

## 4 Before Starting

### Using the external power supply

To power the PD-2 from a household type AC outlet, you will need the optional AD-15 power supply adaptor. The AD-15 adaptor is an AutoVoltage type, which means that it can be connected to most AC outlets, having a voltage range of 100-240V, without modification.

Connection to the PD-2 is made via an XLR 4-32 type connector.

**NOTE:** Make sure the PD-2's power switch is in the OFF position before connecting, disconnecting or powering up the AD-15 adaptor.

When power is fed to the PD-2 via the AD-15 adaptor, the PD-2 automatically switches to the EXT POWER source connection, even if there are batteries loaded.

If the external power source is disconnected, the PD-2 will automatically switch to the internal batteries.

**NOTE:** If the external power supply voltage is lower than the battery, the battery will be used even though the external power source is connected.

### Power supply conditions

The following notes apply to both battery and AD-15 adaptor operation.

If the power supply voltage is between 10V-11V, or above 16V, the word " BATTERY VOLT " will blink on the LCD. Also, an alarm tone will be output to the headphones, every 15 seconds.

The alarm tone can be switched on and off, see soft function " [05] Battery alarm ' Batt ALM ' ", on page 55.

If the power supply voltage is between 9.5V-10V, the warning messages above will be given, also, the cassette will automatically be unloaded and the tape transport will not operate.

If the power supply voltage drops below 9.5V, the PD-2 will completely shut down.

**NOTE:** Serious damage may occur if a voltage higher than 16V is applied when the PD-2 is powered up, or a voltage higher than 18V is applied when the PD-2 is powered down.

### Using batteries

The PD-2 can use two types of battery: the optional BP-12 Ni-Cd battery, or ten " C " size (HP-2) alkali batteries.

**NOTE:** The PD-2 contains an internal circuit that draws a small amount of power even when the recorder is turned off. To avoid draining the battery, we recommend that the power be switched off and the battery removed at the end of the working day.

### Size "C" HP-2 alkali batteries

Disposable HP-2 type alkali batteries are intended for emergency use only. That is, when a fully charged NP-1B is not available.

The life of the alkali batteries is about seven minutes.

Push the spring-loaded slide switch on the battery compartment door, to open it.

With the PD-2 sitting front panel down, the two battery separators will be visible. Load the ten batteries, five a side, either side of the two separators. Make sure that the batteries polarity corresponds to the information on the bottom panel of the PD-2. Close the compartment door.

To remove the batteries, push the spring-loaded slide switch on the battery compartment door, to open it. Then, use the EJECT lever to release the batteries.

**NOTE:** On the bottom panel of the PD-2, there are two adjustment screws. These should be adjusted so that the batteries seat correctly in the battery compartment, eliminating any possibility of them moving around while the PD-2 is being used.

### Ni-Cd battery

The life of a Ni-Cd battery is about 70 minutes, when using the NP-1B type. That is 70 minutes in moderate conditions, in a cold environment the battery life will be reduced.

The Sony NP-1B Ni-Cd battery can be used in the PD-2. These are commonly used in Sony portable cameras.

Push the spring-loaded slide switch on the battery compartment door, to open it.

With the PD-2 sitting front panel up, the two battery separators should lay flat. Load the Ni-Cd battery, terminals first into the compartment. Close the compartment door.

To remove the battery, push the spring-loaded slide switch on the battery compartment door, to open it. Then, use the EJECT lever to eject the battery.

Always turn the PD-2 off before replacing or removing batteries. If the PD-2 is left on, the contents of the internal memory may be lost.

## Battery Charging

**NOTE:** The optional Ni-Cd battery has not been charged at the factory, therefore make sure the battery is fully charged before using it.

With the Ni-Cd battery loaded, connect the AD-15 adaptor. The CHARGE indicator will light. When the indicator is lit, charging is in progress. It takes about six hours to charge a fully discharged NP-1B type battery. After this time the CHARGE indicator will go out.

**NOTE:** The CHARGE indicator does not show the batteries current charge status. It is actually controlled by a timer and is intended to show when the charging time is complete. Once charging has been started, the CHARGE indicator will remain lit for six hours, even if the AD-15 adaptor is disconnected. For this reason, please be careful not to overcharge the battery

There are two micro switches inside the battery compartment, located close to the battery compartment door. They tell the PD-2 what type of battery is loaded, and prevent charging of the ten alkali type batteries.

**NOTE:** We recommend that you use only the FOSTEX AD-15 adaptor. A power supply of 15V 2.5A could be connected, but battery charging may be affected if the voltage is slightly too high or low, also damage may occur to the PD-2.

When installing the alkali type batteries, there are two micro-switches that can be depressed. Make sure that nothing falls in the battery compartment, that is, small hand tools, etc., because, while the two micro-switches are depressed, charging current will flow into the alkali batteries.

**NOTE:** Do not attempt to charge alkali type batteries.

## Battery check

To check the battery status, press the BATT key on the front panel.

The battery status will be shown as: " BATTERY VOLT " , " Value ".

The CH2 bargraph will show the battery voltage under load, at the instant the BATT key was pressed.

Although this function is intended for checking the battery voltage, if an external power supply is being used, its output voltage will be displayed.

## Reducing battery consumption

To reduce battery drain, follow the guidelines below:

- 1) If you are not recording, do not connect a signal to the DIGITAL IN connector (the D/A converter is only powered up when a digital signal is present at the DIGITAL IN connector). The D/A converter allows the digital input signal to be monitored.
- 2) If you are not recording, set the INPUT SW to LINE (the microphone pre-amp and the limiter circuits are only powered up when this switch is set to microphone).
- 3) Whenever possible, connect the PD-2's outputs to input loads higher than 10k  $\Omega$ . 600  $\Omega$  input loads will only drain the battery quicker.
- 4) When using a balanced output in unbalanced mode, do not connect the unused connector terminal to ground, leave it unconnected (the output level will be 6dB less than for balanced operation, but the performance will be the same).
- 5) Keep headphone and monitor speaker volume levels to a usable minimum.
- 6) Only use the LCD light when necessary.
- 7) Do not leave the PD-2 in pause mode for long periods of time, as this keeps the head cylinder rotating.

## Powering up the PD-2

With either batteries or the AD-15 adaptor connected, switch on the POWER SW.

The PD-2 will engage full stop mode. If a cassette is already loaded in the PD-2, the tape will be drawn from the cassette around the drum, then full stop mode will be engaged.

It takes about two seconds for the PD-2 to power down, while the tape is drawn back into the cassette.

## Important notes about using DAT cassettes

Use quality DAT cassettes only in the PD-2.

Do not store DAT cassettes near strong magnetic fields; e.g., loudspeakers, video monitors, televisions, transformers, etc.

Do not expose DAT cassettes to extremes of temperature or humidity, or store tapes in a dusty or dirty environment.

Do not open the cassette's locking flap. Dust and hand grease on the tape can cause dropout and/or damage to the PD-2 cassette mechanism.

Never switch off the PD-2 while the tape transport is active.

If a cassette has been stored in a cold place (E.g., overnight in a car) and is to be used in a warmer environment, allow about an hour for the cassette to acclimatize before using it in the PD-2. Failure to observe this precaution may cause malfunction and/or damage to the PD-2.

While a DAT cassette is being used it will get slightly warm. This is normal and no damage will occur.

## Inserting cassettes

Use the OPEN lever to open the protective cassette cover.

Press EJECT, to raise the cassette carrier.

Insert the cassette, face up (writing on top), into the cassette carrier. Push the cassette until it clicks into place. Push the cassette carrier down until it clicks into place. Close the protective cassette cover.

## Ejecting cassettes

Use the OPEN lever to open the protective cassette cover.

Press EJECT, to raise the cassette carrier.

Remove the cassette from the carrier. Push the cassette carrier down until it clicks into place. Close the protective cassette cover.

**NOTE:** To prevent dust and dirt entering the tape transport section, do not leave the cassette carrier and the protective cover open longer than necessary.

## Accidental erasure protection

On the bottom edge of a DAT cassette is a write protect tab. This is useful for protecting recordings from accidental erasure.

With the tab closed (hole covered), recording is possible.

With the tab open (hole open), recording is not possible.

## 5 Input Connections

### ANALOG IN

CH1 and CH2 ANALOG INPUTS are balanced XLR 3-31 type connections. Use the INPUT SW to select either LINE or MIC. If a digital signal is input via the DIGITAL IN connector, the input source will automatically switch to the digital input connection, and the microphone AMP and limiter circuit's power supply will switch off to reduce battery consumption.

### DIGITAL IN

Balanced XLR 3-31 type connection for inputting PCM audio conforming to the consumer (SP DIF) and professional (AES/EBU) of IEC 958.

When a digital signal is fed to the DIGITAL IN connector and is the same Fs as the FRAME RATE selector setting, the PD-2's input source automatically switches to the digital input connection, and power is fed to the D/A converter so that you can monitor the digital input signal (power is not normally fed to the D/A converter to reduce battery consumption). The microphone AMP and limiter circuit's power supply will switch off to reduce battery consumption.

When a digital signal is detected at the DIGITAL IN connector, the word "DIGITAL" will appear on the LCD. The sampling frequency of the digital input signal will also be shown on the LCD.

Synchronization will be achieved using the SYNC PREAMBLE in the digital input signal. If the digital input signal is from a "Consumer" format DAT machine using a phono/RCA jack type connection, or the DAT signal is "dirty", with dropouts, etc., the sync detection time may need to be increased. See soft function "[23] Sync detect time of DIGITAL input connection 'DigToler'", on page 57.

An external word sync signal can be connected to the WORD IN connector, see soft function "[21] Digital input word sync select 'Dig SYNC'", on page 56, for external word sync input settings.

When the digital input signal conforms to the consumer (SP DIF) of IEC 958, synchronization can only be achieved using the SYNC PREAMBLE in the digital signal. ID information received as USERS BIT can be copied.

In digital input mode, TC time delay compensation, "td", is set to 0. Time delay compensation is necessary because of the time delay caused by the A/D convertor. In analog input mode, "td" is automatically established.

If a digital signal that the PD-2 does not recognize is connected to the DIGITAL IN connector, analog input mode will automatically be selected.

### TC INPUT

A balanced XLR 3-31 type connection for inputting SMPTE/EBU TC.

When a valid external TC is connected to the TC INPUT connector, the TC source selector will automatically switch from internal to external. When external TC is being input, "EXT" will appear next to "TC IND" on the LCD.

A valid TC signal must meet the following requirements:

- 1) It must be continuous in the positive direction.
- 2) The SYNC WORD cycle and the FRAME DATA must coincide.
- 3) There must be no dropouts in the TC signal.

If the above conditions are not met, the word "EXT" on the LCD will blink.

TC can be used as the SYNC source, see soft function "[55] TC sync mode 'TC Sync'", on page 62. During this mode, you must not connect an external sync source to the SYNC IN connector. When TC sync is operating, the word "TC" will appear next to "SYNC" on

the LCD.

If the TC contains a large amount of jitter (W/F), it might be difficult to achieve synchronization. This is especially true with LTC (longitudinal timecode) recorded on analog tape machines.

Therefore, the use of TC as the sync source is not recommended.

## WORD SYNC IN

A BNC type connector for connecting an external word sync source.

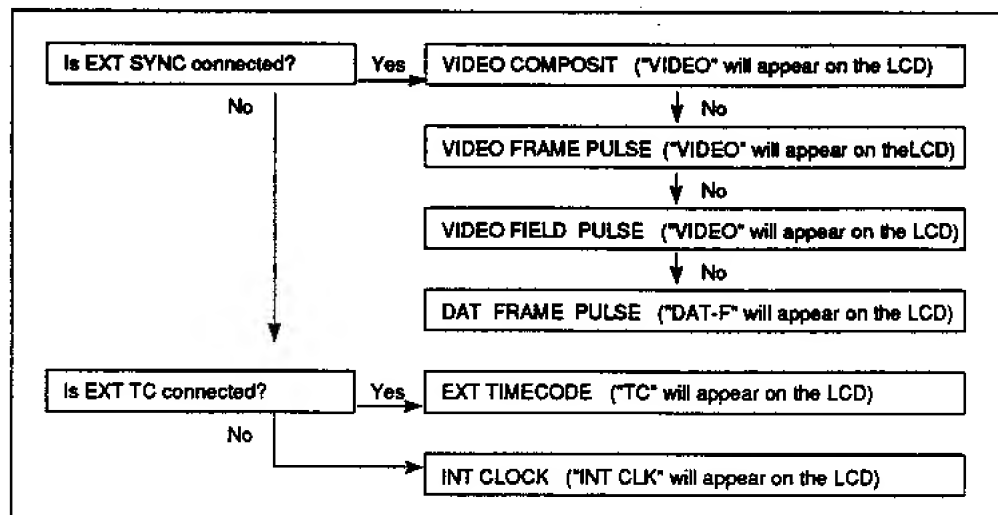
When a valid word sync (word clock) signal is connected to the WORD IN connector, external sync mode is automatically selected. When external word sync is being used, the word "WORD" will appear next to "SYNC" on the LCD.

External word sync can also be used during digital input signal mode. see soft function "[21] Digital input word sync select 'Dig SYNC'", on page 56.

## SYNC IN

A BNC type connector for connecting an external sync source.

When a valid sync signal is connected to the SYNC IN connector, external sync source selection is carried out in the following order of priority.



When an EXT sync source is first connected to the EXT SYNC connector, before the PD-2 locks onto the EXT sync, the words "INT CLK", "VIDEO", "DAT-F" and "TC" will blink on the LCD for five seconds and the alarm tone will sound.

If the EXT sync is being derived from the DIGITAL IN or WORD IN connectors, the PD-2 will lock immediately, and nothing will blink on the LCD.

If the connected sync signal is not valid, the word "INT CLK", "VIDEO", "DAT-F" or "TC" will blink on the LCD.

The frequency accuracy of the external sync signals and the TC must be within  $\pm 100$ ppm.

If a sync signal's accuracy exceeds this tolerance, unreliable operation may occur. The word "SYNC" on the LCD will blink to warn you when this tolerance has been exceeded.

When using an EXT SYNC signal and a WORD SYNC signal, the following conditions apply.

- 1) If EXT SYNC is DAT FRAME: Operation will be parallel.
- 2) All other sync signals: Priority is given to the WORD SYNC.

**NOTE:** If external sync is not being used, disconnect any cables from the SYNC IN connector to avoid malfunction.



## 6 Output Connections

### ANALOG OUT

CH1 and CH2 ANALOG OUTPUTS are balanced XLR 3-32 type connections. The nominal output level and headroom are determined by the setting of the Reference Marker. See, "LCD reference markers", on page 52, for full details.

The signal output from the ANALOG OUTPUTS depends on the settings of the OUTPUT SOURCE SW (63) and the REC MON SW (14).

When the PD-2 is connected to equipment with unbalanced inputs, use only the GND and HOT pins. The unused pin can be either left open or connected to GND, in either case, performance of the PD-2 is not affected.

**NOTE:** Connecting the unused connector terminal to ground increases the battery consumption.

### DIGITAL OUT

XLR 3-32 type connection for outputting PCM audio conforming to the consumer (SP DIF) and professional (AES/EBU) of IEC 958.

To select the output format, professional or consumer, see soft function "[20] Digital output format 'Dig Out'", on page 56.

When the output format is set to professional (AES/EBU), SCMS regulations do not apply. Also, ID information, such as START ID and SKIP ID will be output as USERS BIT.

TC time delay compensation, "td", can be switched on or off, see soft function "[56] TC delay 'TC delay'", on page 62. Time delay compensation is necessary because of the time delay caused by the D/A convertor.

When the output format is set to consumer format, digital signals will be output if it contains S-ID information.

### TC OUTPUT

A balanced XLR 3-32 type connection for outputting the reproduced SMPTE/EBU TC. The TC signal output depends on the current mode:

REC, PLAY	TC off tape is output.
FF, REW, CUE	Can be switched ON (that is, TC is output only when it can be read off tape), OFF (no TC output) and output five continuous frames of TC when TC can be read. See soft function "[58] Fast wind TC select 'Wind TC'", on page 63.
PAUSE	Can be switched ON or OFF, see soft function "[59] Pause TC select 'Pause TC'", on page 63.

TC time delay compensation, "td", can be switched on or off, see soft function "[56] TC delay 'TC delay'", on page 62. Time delay compensation is necessary because of the time delay caused by the D/A convertor.

## TC LOOP OUT

A balanced XLR 3-32 type connection that directly outputs signals appearing at the TC INPUT connector.

The signal does not pass through any active components.

## SYNC OUT

A BNC type connector for outputting SYNC data.

The VIDEO FRAME SYNC PULSE used by the PD-2 is output here (a negative pulse waveform that is low for about 20ms).

If a DAT FRAME SYNC signal is connected to the SYNC IN connector, the signal output will depend on the current mode.

MODE	OUTPUT
REC, REC PAUSE	DAT frame sync signal of using at the REC head
Other modes	DAT frame sync signal of using at the REPRO head

The sync output signal can be fixed to only one type of sync output, see soft function" [65]  
Sync out select ' Sync Out ' ", on page 64.

## WORD SYNC OUT

A BNC type connector for outputting WORD SYNC data.

The WORD SYNC signal that is used internally in the PD-2 is output.

If the sync source is external, a WORD SYNC signal that is in sync with the external sync is output.

## 7 Tape Transport Controls

### STOP

The STOP key has two modes of operation:

- 1) When the PD-2 is powered up, full stop mode is engaged. That is, the tape is loaded, but the capstan and drum are not rotating.
- 2) Pressing the STOP key will put the PD-2 into pause mode, and the PAUSE key LED will illuminate. In pause mode the drum cylinder will rotate at normal play speed and the tape will be in contact with the drum. This reduces play and record start up times.

Repeated pressing of the STOP key allows you to toggle between PAUSE and STOP modes.

The PD-2 will automatically switch to STOP mode, from PAUSE mode, after three minutes (to change this time, see soft function " [40] Pause cancel time 'PAUSE TM' ", on page 58).

**NOTE:** To prevent premature tape and/or drum wear, use the pause mode only when necessary.

### REWIND & F.FWD

The REWIND/F.FWD keys have two modes of operation:

- 1) Pressing the key once will start the slow rewind/forward mode, and the following conditions will apply.

The pinch roller is pressed against the capstan.

The capstan rotates at 5x play speed (this can be changed, see soft function " [46] Slow F.FWD, REW speed 'CueSpeed' ", on page 59).

The drum cylinder rotates at the normal play speed.

In slow rewind mode the REW and PLAY LEDs are illuminated.

In slow forward mode the F.FWD and PLAY LEDs are illuminated.

- 2) Pressing the key once again will start fast rewind/forward mode, and the following conditions will apply.

Rewind/forward speed is 100x play speed.

The pinch roller is not pressed against the capstan.

In fast rewind mode the REW LED is illuminated.

In fast forward mode the F.FWD is illuminated.

Repeated pressing of the REW/F.FWD key allows you to toggle between slow and fast rewind/forward modes.

## PLAY

Press to start playback mode.

The ANALOG OUT and the DIGITAL OUT connections are automatically switched from input monitoring to off-tape monitoring (taking into account the positions of the REC MON SW and the OUTPUT SOURCE SW).

The play mode start up time depends on the current mode:

MODE	TIME
PAUSE → PLAY	Less than 0.6 seconds
STOP → PLAY	Less than 1.2 seconds

If a blank tape section is played back, the word " BLANK " will appear in TC field on the LCD.

If no track sync data is detected on the tape, the PD-2 assumes that it is a blank tape, and switches from ATF (Auto Track Finding) to free run mode.

If the PLAY key is pressed while the PD-2 is searching or locating, Auto Play mode will be engaged, and the PLAY LED will flash. When the PD-2 stops at the location point, it will automatically start play.

## REC

Slide the REC switch sideways to start recording. The REC LED illuminates to indicate recording is in progress.

Record mode start up time is the same as for play mode.

While recording, all transport functions are disabled except PAUSE. To stop recording, first press PAUSE, then STOP.

The following keys are disabled while recording: PLAY, STOP, F.FWD, REW, ERROR SEARCH, BLANK SEARCH, and LOCATE keys LOC M1, LOC M2, TC, A-TIME and PNO.

If the CLR key is held down and the REC key is pressed, the audio signal being recorded will be muted (digital zeros will be recorded). Releasing the CLR key will un-mute the signal and normal recording will continue.

Audio signal muting can also be performed during record mode. With the PD-2 in record mode, press and hold the CLR key, then slide the REC key to mute, release the CLR key to un-mute the signal and continue recording.

## PAUSE

**The pause key can only be used during record mode.**

When the PAUSE key is pressed during record mode, the PAUSE key LED will illuminate.

Pause mode is cancelled if either the STOP, or EJECT key is pressed, or if the pause time exceeds the pause release time. See soft function "[40] Pause cancel time 'PAUSE TM'", on page 58.

During pause mode the following conditions apply:

The pinch roller is pressed against the capstan.

The capstan motor will not rotate.

The drum will continue to rotate.

The PAUSE LED will illuminate.

## 8 Recording

### Setting the sampling frequency

To set the Fs, use the Fs(kHz) switch on the top panel. The three options are 48kHz, 44.1kHz and 44.056kHz. The current Fs setting will be displayed on the LCD.

If the Fs of the digital input signal is different to the PD-2's Fs SW setting, the Fs of the digital input will be shown on the LCD and the Fs SW setting will blink. No sound will be output until the PD-2's Fs SW is set to the same Fs as the incoming digital signal.

The above also applies when playing back prerecorded DAT cassettes, no sound will be output until, the PD-2's Fs SW is set to the same Fs that was used during the recording of the prerecorded cassette.

**NOTE:** Fs cannot be changed while recording is in progress. If a different Fs is selected while recording, it will only become effective after recording has stopped.

### Microphone input settings

**NOTE:** The following five functions can only be used when the INPUT SW is set to MIC. To reduce battery consumption power is not fed to the microphone amp and limiter circuit when the INPUT SW is set to LINE or a digital signal is connected to the DIGITAL IN connector.

#### Filter

There are four filter options that can be used when recording with microphones. CH1 and CH2 can be set individually.

Use the FILTER SW to select one of the following options:

- F** FLAT or FILTER OFF (the only filter affecting the audio signal will be the antialiasing filter in the AD conversion).
- M** MUSIC. 12dB/oct filter,  $f_c = 40\text{Hz}$ .
- V1** VOICE 1. 12dB/oct filter,  $f_c = 80\text{Hz}$ .
- V2** VOICE 2. 6dB/oct filter,  $f_c = 400\text{Hz}$ .

#### Limiter

The limiter allows a more consistent signal level to be achieved when recording with microphones. The limiter for each channel is switched ON and OFF using the LIMIT SW, on the front panel.

The limiter is a VCA circuit with the threshold set at 10dB below 16-bit full scale level.

A compression ratio of 1/3 will be applied to signal levels above the threshold.

The bottom end of the LCD bargraphs indicate the level of signal compression being applied.

The limiter attack time is 20ms and the release time is 200ms.

CH1 and CH2's limiters can work independently, or linked. When linked, if one channel limiter operates, the other channel limiter operates too. See soft function " [14] Limiter link select ' Lim Link ' ", on page 56.

## Phantom

For use with condenser type microphones that require external powering. CH1 and CH2 can be set individually.

Use the PHANTOM SW to select one of the following options:

- OFF** Phantom power is switched off.
- P48** 48V phantom powering. +48V is supplied to pins 2 and 3 of the ANALOG INPUT connectors (the voltage output can be changed, see soft function " [12] Phantom power voltage select 'Phantom' ", on page 56).
- T12** 12V balanced A-B supply, AB FEED POWER, for use with the Sennheiser rifle-type microphone, etc., (the voltage is between pins 2 and 3 of the ANALOG IN connectors).

**NOTE:** When the PHANTOM SW is adjusted, a large audible click is produced. So make sure the INPUT selector switch is set to LINE before adjusting.

## ATT

To prevent the microphone amplifier from clipping, 15dB and 30dB of gain attenuation can be applied to the microphone amplifier.

CH1 and CH2 can be set individually.

Use the ATT(dB) SW to select 0 (no attenuation), 15(15dB of attenuation) or 30 (30dB of attenuation).

## Phase

With this switch set to the " REV " position, the phase of CH2's microphone input is reversed by 180°

Use the PHASE SW to select either NORM or REV.

## Record monitoring options

### Headphones

The PHONES connector, on the front panel, is a standard 6.35mm stereo phone jack.

The PHONES LEVEL control is a push lock type. This means that once it has been set, it can be recessed to prevent accidental adjustment.

To recess the control, press the control down until it clicks into place. To bring up the control for further adjustment, press down on the control until it clicks.

The PHONES LEVEL control is a dual-gang type (CH1 and CH2) and the resistance curve is " type A " (logarithmic).

The signal source for the headphones depends on the setting of the REC MON SW. The following table shows how it works.

REC MON SW	MODE	SOURCE
INPUT	F.FWD, REW, PAUSE, REC	INPUT
	PLAY, CUE	OFF TAPE
REPRO	F.FWD, REW, PAUSE	IN PUT
	REC, PLAY, CUE	OFF TAPE

By using the two phones switches, six headphone monitoring modes are available. The following table explains the use of each mode.

	1/ST	2/MONO
MS	MS STEREO DECODE	MS MONO DECODE
AB	STEREO	CH1 & CH2
CHANNEL	CH1 MONO	CH2 MONO

To make use of the MS decode options, MS microphone recording techniques must be used.

The relationship between the channels is as follows:

Ach - 1ch - Lch - MID ch

Bch - 2ch - Rch - SIDE ch

## Internal speaker

The volume level of the internal speaker is controlled by the MON LEVEL control.

When the control is turned fully anticlockwise, it will "physically" click. This is not an on/off switch, but two safety locks that stop the control being used accidentally.

The resistance curve is "type A" (logarithmic).

The MON LEVEL control is a push lock type. This means that once it has been set, it can be recessed to prevent accidental adjustment.

To recess the control, press the control down until it clicks into place. To bring up the control for further adjustment, press down on the control until it clicks.

The signal source for the internal speaker depends on the setting of the REC MON SW.

The following table shows how it works.

REC MON SW	MODE	SOURCE
INPUT	F.FWD, REW, PAUSE, REC	INPUT
	PLAY, CUE	OFF TAPE
REPRO	F.FWD, REW, PAUSE	INPUT
	REC, PLAY, CUE	OFF TAPE

**NOTE:** The above signal source selection table is the same as for the headphones, but the internal speaker is not affected by any of the six headphone monitor modes.

## Digital output

The signal source selection for the DIGITAL OUT connection is the same as for the headphones. For clarity the table is shown again below.

REC MON SW	MODE	SOURCE
INPUT	F.FWD, REW, PAUSE, REC	INPUT
	PLAY, CUE	OFF TAPE
REPRO	F.FWD, REW, PAUSE	INPUT
	REC, PLAY, CUE	OFF TAPE

**NOTE:** Although the above signal source selection table is the same as for the headphones, the DIGITAL OUT is not affected by any of the six headphone monitor modes.

## Meter display mode

Select the signal source for the LCD bargraphs. The signal displayed on the bargraphs depends on the settings of the METER SW and the REC MON SW. The table below shows how it works.

METER SW	REC MON SW	MODE	SOURCE
INPUT	INPUT	F.FWD, REW, PAUSE, REC	INPUT
INPUT	REPRO	PLAY, CUE	OFF TAPE
MON	INPUT		
MON	REPRO	F.FWD, REW, PAUSE	INPUT
		REC, PLAY, CUE	OFF TAPE

When monitoring input signals, PCM audio after A/D conversion is monitored.

When monitoring output signals, PCM audio before D/A conversion is monitored.

The peak hold time of the bargraphs can be set, see soft function " [25] Bargraph peak hold time 'PeakHold' ", on page 57.

## Output source selection

Select the signal source for the ANALOG OUT connection. The signal output depends on the settings of the OUTPUT SOURCE SW and the REC MON SW. The table below shows how it works.

OUTPUT SOURCE SW	REC MON SW	MODE	SOURCE
INPUT	INPUT	F.FWD, REW, PAUSE, REC	INPUT
INPUT	REPRO	PLAY, CUE	OFF TAPE
MON	INPUT		
MON	REPRO	F.FWD, REW, PAUSE	INPUT
		REC, PLAY, CUE	OFF TAPE

## Audio recording

### MIC/line selection

Use the INPUT SW to set the ANALOG IN connections for either microphone or LINE operation.

**NOTE:** As the same INPUT connectors are used for both microphone and LINE sources, make sure the INPUT SW is set to the required position before making the connection.



## Level setting

The input signal level is adjusted using the CH1 and CH2 rotary controls, on the front panel. With the GANG lever in the NORMAL position, independent level adjustment of CH1 and CH2 is possible. With the GANG lever in the GANG position, CH1 and CH2 controls are mechanically linked. This is useful for adjusting CH1 and CH2 signal levels using only one control.

The resistance curve of both controls are " type A " (logarithmic). The controls have a 10dB volume margin between the nominal position, " 7 " , and the maximum position.

With digital recorders not being as sympathetic towards excessive signal levels as analog tape recorders, record level setting is an important consideration.

Do not let the signal level exceed 0dB on the LCD bargraphs, as signal distortion may occur. At the same time, try to keep the signal peaks as close to 0dB, but without exceeding it. For details about signal headroom, see, " LCD reference markers " , on page 52.

When recording outdoors with microphones, it is usually difficult to determine the peak signal level, therefore reduce the record level a little to allow for signal peaks. Use the built-in limiter and the bargraph peak hold facility.

## Emphasis

With the EMPHASIS SW in the ON position, emphasis will be applied to an analog input signal while recording, and the status data will be recorded onto tape. The word " EMPHASIS " will appear on the LCD.

During playback the emphasis circuit is controlled by the ID bits recorded on the tape. If a prerecorded tape was recorded with emphasis the de-emphasis circuit will automatically be switched on during playback, and the word " EMPHASIS " will blink on the LCD.

If an emphasised digital signal is connected to the DIGITAL IN connector the PD-2's emphasis function will be switched on automatically, regardless of the EMPHASIS SW setting.

## Overload indicator

The OVERLOAD LED will illuminate when clipping occurs in either CH1 or CH2's input amplifier (microphone amp or LINE amp). The LED will remain illuminated for about 0.5 sec after instantaneous clipping. The response time of the overload circuit is about 10msec. If clipping does occur, the word CH1 or CH2 (or both), depending on which channel has clipped, on the LCD will blink. Use the MESSAGE RESET SW to stop the blinking.

When clipping occurs, an ERROR MARK will be recorded onto tape.

Also, if the ERR TONE SW is in the ON position, an error tone is output to the internal speaker and the headphones.

**NOTE:** If the PHONES LEVEL or the MON LEVEL controls are turned fully anticlockwise, the error tone will not be heard.

## Mute recording

If the CLR key is held down and the REC key is pressed, the audio signal being recorded will be muted (digital zeros will be recorded). Releasing the CLR key will un-mute the signal and normal recording will continue.

Audio signal muting can also be performed during record mode. With the PD-2 in record mode, press and hold the CLR key, then slide the REC key to mute, release the CLR key to un-mute the signal and continue recording.

## Slate microphone

With the SLATE SW held in the MIC position, sound that is picked up by the internal condenser microphone is recorded onto tape CH1 and CH2.

The microphone's amplifier contains an AGC circuit, to prevent signal clipping.

**NOTE:** The Slate microphone does not work when a digital input signal is applied.

## Slate tone

With the SLATE SW held in the TONE position, a tone with the specifications below is recorded onto tape CH1 and CH2.

Frequency	1kHz
Level	REF LEVEL (see soft function " [10] REF marker position 'REF MARK' " on page 55, to change the level).
Stability	$\pm 0.5\text{dB}$ ( $-20^{\circ}\text{C}$ - $+40^{\circ}\text{C}$ )

**NOTE:** The Slate tone does not work when a digital input signal is applied.

**NOTE:** When the PHASE SW is set to "REV" and the phones switches are set to CH1 + CH2, in MONO mode, neither the slate tone nor the slate microphone can be heard.

## Starting record mode

When all the required connections, settings and monitoring options have been set. Slide the REC key to the right to start recording. Recording can be paused by pressing the PAUSE key. While recording is in progress, all other transport functions are disabled, except PAUSE. To stop recording, press PAUSE, then press STOP.

## Digital copying

If the PD-2 is being used for digital copying purposes, with the PD-2 used as the recorder, see soft function " [22] START ID recording select 'Dig S-ID' ", on page 57, to select whether or not the PD-2 records START IDs.

Also, see soft function " [23] Sync detect time of DIGITAL input connection 'DigToler' ", on page 57. This function is useful when connecting to a " Consumer Format " DAT machine that has a phono/RCA jack type connection. It can also be used when the PD-2 is receiving a " dirty " DAT signal, one with dropouts, etc.

## Timecode recording

Before recording TC, check the settings of soft functions 50 to 61.

### Frame rate selection

To select the type of TC to be recorded, IEC, FOSTEX, etc., see soft function 50.

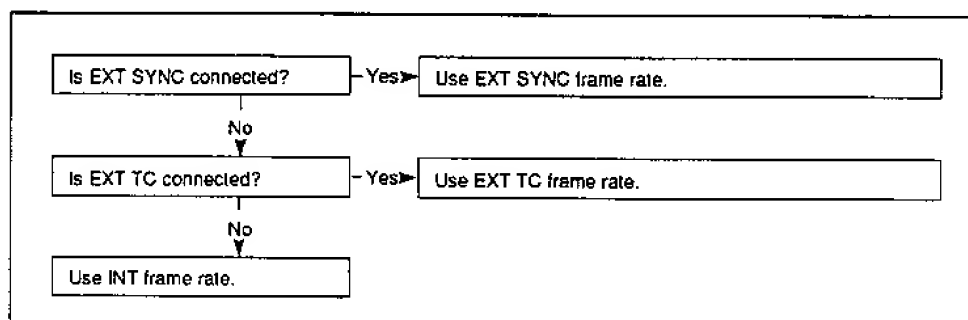
The IEC TC format is the standard format for DAT timecode recording. Locating using TC can only be performed when the tape that has been recorded with the IEC TC. The FOSTEX format was originally developed for the D-20 Recorder, before a standard had been agreed. The FOSTEX format has been incorporated on the PD-2, to provide interchangeability for existing D-20 owners.

When recording IEC format TC, use the FRAME RATE SW, on the top panel, to set the INT frame rate of the internal TC generator.

- \* 24 fps (American motion picture)
- \* 25 fps (European film/PAL-SECAM video EBU)
- \* 30 fps (NTSC video/film)
- \* 29.97 fps drop frame (NTSC colour with real time adjust)
- \* 29.97 fps non-drop frame (NTSC colour)

The current frame rate setting is shown on the LCD.

If an EXT SYNC or EXT TC signal is connected, the frame rate setting will follow the diagram below. EXT SYNC has priority, then EXT TC then the INT frame rate setting. The frame rate of the EXT SYNC will show on the LCD. If it is different to the PD-2's frame rate setting, the PD-2's frame rate will blink on the LCD, but the PD-2 will use the EXT SYNC frame rate.



If signals are applied to both the EXT SYNC and the EXT TC connectors, and the internal frame rate setting is different, the INT frame rate will blink on the LCD.

If, during recording the EXT TC drops out, the INT generator will free-run for a predetermined time, see soft function " [54] TC drop out compensation 'TC Drop' ", on page 62. If drop out exceeds this period, the error tone will be heard and TC will not be recorded on tape.

When a prerecorded tape with a different frame rate to the current INT frame rate setting is played back, the frame rate used on the tape will be output, and the frame rate will appear on the LCD. The current INT frame rate setting will blink on the LCD.

**NOTE:** The above warns you that if recording is started, two different types of TC will exist on one tape.

If an IEC format prerecorded tape with a different frame rate to the REPRO frame rate, see soft function " [57] Replay TC frame select 'IECFrame' ", on page 62, both the tape frame rate and the REPRO frame rate will blink on the LCD.

## Setting the TC generator start time

- 1) Press the RCL key, the word "RCL" will show on the LCD, then press the TC key.
- 2) Use the, "◀" and "▶", cursor keys to select the pair of digits that you wish to change and the numeric key-pad to enter values. The currently selected digits will blink.

To use the current real time as the TC start time, press and hold the CLR key, then press the DATE key.

If you make a mistake, press the CLR key to reset the currently selected pair of digits to 00. To quit out of this function, press the QUIT key.

- 3) With the desired TC on the display, press the EXEC key to store it.

**NOTE:** Some synchronizers do not read the hours and minutes information in timecode. When recording past midnight, a change from 23:59:59.29 to 00:00:00.00 may cause errors with this type of synchronizer. Therefore, always stop recording before midnight, wait, then continue recording starting from 00:00:00.00.

## JAM TC recording

The JAM function allows you disconnect the EXT TC source, after initial TC synchronization has been started, and let the internal generator continue striping the tape.

**NOTE:** This function can only be used when recording IEC TC format.

The use of a crystal oscillator in the PD-2 ensures that there is no timing difference between the internal and external TC.

The JAM function works in two modes: EXT TC connection only, and EXT TC and video signal connection.

### EXT TC connection only

The following conditions must be met.

- a) EXT TC is connected to the TC IN connector.
- b) Soft function "[55] TC sync mode 'TC Sync'", on page 62, is set to "01" :  
Sync with the TC signal of the connected EXT TC.
- c) The word "EXT" is showing by TC IND on the LCD.
- d) The word "TC" is showing by SYNC on the LCD.
- e) Nothing is connected to the following connectors, WORD IN, DIGITAL IN or SYNC IN.
- f) The PD-2's FRAME RATE selector is set to the frame rate of the EXT TC.

When all the above conditions are met, the running time data and frame timing of the INT TC will match that of the EXT TC.

When the JAM SW is held in the ON position, the INT TC generator will continue with the running time data and frame timing. On the LCD the word "INT" and "JAM" will appear by TC IND and "EXT" will blink. "INT" will appear by SYNC.

The EXT TC can now be disconnected, the word "EXT" will disappear from the LCD. If conditions b) and d) are not met (the sync signal of the EXT TC is not used, only running time data, etc.), operation will be as follows.

The INT TC and EXT TC are free running (time data and frame timing do not match). The TC used for monitoring and recording will be EXT TC. On the LCD the word "EXT" will be shown by TC IND and "INT" will be shown by SYNC.

When the JAM SW is held in the ON position, the INT TC and EXT TC time data value will match. The TC used for monitoring and recording will now be INT TC. On the LCD the word "INT" and "JAM" will appear by TC IND and "EXT" will blink. "INT" will appear by SYNC.

The EXT TC can now be disconnected, the word "EXT" will disappear from the LCD. However, the frame timing of the INT TC and the EXT TC is not synchronized, so during the change over from EXT to INT the TC will be discontinuous by 1 frame. It is therefore recommended that this JAM operation is not performed while recording. Or, that the JAM mode is entered before recording is started. Though, even if the JAM mode is entered before recording, the editing accuracy of the prerecorded source will be within  $\pm 1$  frame.

### EXT TC and video signal connection

The following conditions must be met.

- a) EXT TC is connected to the TC IN connector.
- b) Video signal is connected to the SYNC IN connector.
- c) The EXT TC is externally synchronized to the video signal.
- d) The word "EXT" is showing by TC IND on the LCD.
- e) The word "VIDEO" is showing by SYNC on the LCD.
- f) Nothing is connected to the following connectors, WORD IN, DIGITAL IN.
- g) The PD-2's FRAME RATE selector is set to the frame rate of the EXT TC and video signal.

When all the above conditions are met, the INT generator will synchronize with the video signal and use the time data of the EXT TC.

When the JAM SW is held in the ON position, the INT TC generator will continue with the running time data and frame timing will be synchronized to the video signal. On the LCD the word "INT" and "JAM" will appear by TC IND and "EXT" will blink. "VIDEO" will appear by SYNC.

The EXT TC can now be disconnected, the word "EXT" will disappear from the LCD. The video signal can now be disconnected, the INT generator will run with continuous frame timing. On the LCD the word "INT" and "JAM" will appear by TC IND and "VIDEO", by SYNC, will change to "INT".

**NOTE:** In both cases, "EXT TC connection only" and "EXT TC and video signal connection", when the words "INT" and "JAM" are shown by the TC IND, you cannot set the INT TC generator's start time. Also, even if soft function "[53] INT TC Gen mode 'TC Gen'", on page 61, is set to "00: Rec Run" mode, it will not work.

If an EXT TC signal is connected while the words "INT" and "JAM" are shown on the LCD, the word "EXT" will blink.

When the JAM SW is held in the ON position for two seconds or more, the TC used for monitoring and recording will change to the EXT TC. The word "EXT" will stop blinking and show continuously.

When the JAM SW is held in the ON position for two seconds or more, while the words "INT" and "JAM" are shown on the LCD (NOT indicating "EXT"), JAM mode is cancelled. The TC used for monitoring and recording will continue as INT TC.

## TC monitoring

The EXT TC may be monitored through the internal speaker and headphones. TC generated internally cannot be monitored as sound, because it is generated software-wise. Both INT and EXT TC is monitored by the LCD bargraphs. The TC MON SW is a momentary type, so TC will be monitored only when the switch is held in the ON position. While TC is being monitored, the TC contents will be displayed on the LCD. The source of the TC depends on the current operating mode. The table below shows how it works. The TC output level will be 30dB below 16bit full scale level. A START ID and a PNO are usually recorded simultaneously, but if the previous PNO cannot be read, only the START ID will be recorded.

MODE	SOURCE
F.FWD, REW, PAUSE, STOP	TC IN connection or INT TC
REC, PLAY, CUE	Off tape

## Setting the Internal Generator Output Mode

- 1) Select soft function "51-02 INT time code is output".
- 2) Select frame rate via the top panel FRAME RATE switch and soft function "52 Mode DF".
- 3) If there is no external TC, the internal TC generator time can be shown on the LCD with the "TC MON" switch.
- 4) If TC is recorded on the tape in IEC format, the time of the IEC format playback time code will be shown on the LCD and during the TC locate operation, PD-2 will enter the locate mode according to this time.
- 5) By setup of soft function "61 TC UBit", U-Bit data is added to the time code data and output.

Internal Time Code Generator Output at Soft Function "53-00 Rec Run".

During the "Rec Run" mode, the required internal TC output can be obtained as follows depending on the present mode of the transport:

From REC Mode .....	Internal TC GEN is output.
From PLAY Mode .....	Playback TC is output with the input monitor timing.
From PAUSE, FF/REW .....	Playback TC in Soft Function settings 58 and 59 are output with the input monitor timing.

**NOTE :** Limitations in using the internal TC output are:

- 1) TC sync of the PD-2 is not possible via TC output with this function.
- 2) If an external TC is connected, the internal TC GEN will not be output except when in JAM sync.
- 3) Sound cannot be monitored.

## I D recording

### START ID and PNO recording

A START ID and a PNO are usually recorded simultaneously, but if the previous PNO cannot be read, only the START ID will be recorded.

It takes nine seconds to record a START ID and a PNO. During this time the word " S-ID " and the new PNO (e.g. " 001 " ) will blink on the LCD.

When a START ID is detected during playback, the word " S-ID " will appear on the LCD (nine seconds). The PNO is continuously displayed. If the PNO cannot be read, the PNO display will show " -- " .

A PNO can be recorded in one of two modes, auto or manual. The starting PNO can be set to any value.

**NOTE:** If the S-ID key is pressed while a START ID is being recorded (nine seconds), a new START ID will be written. When START IDs are recorded less than 10 seconds apart, the LOCATE function may fail to read them. Always leave more than 10 seconds between START IDs.

### PNO manual mode

Set the PNO SW to the MANU position. To record a START ID while recording, press the S-ID key.

If the tape is being recorded from the beginning, the first PNO will be 001. The value of the next recorded PNO will increment automatically.

If the S-ID key is pressed while recording on a tape that already contains PNOs (a partially recorded tape), and the previous PNO was read, the new PNO will increment from that PNO. If the previous PNO was not read, no PNO will be recorded, only a START ID.

### PNO auto mode

With the PNO SW set to the AUTO position, START IDs can be recorded using the same method as manual mode. Additionally, a START ID is recorded every time record mode is started using the REC key.

### Setting the start PNO

The value of the PNO to be recorded on the tape in both manual and auto modes can be set via this function.

- 1) Press the RCL key and then the PNO key. If a PNO is recorded on the tape, the next PNO to be recorded will be indicated. The lowest digit of the three digit display will blink.
- 2) Use the cursor keys to select the digit that you wish to change and the numeric key-pad to enter values. The currently selected digit will blink. If you make a mistake, press the CLR key to reset the PNO value to 000. To quit out of this function, press the QUIT key.
- 3) With the desired PNO value on the display, press the EXEC key to enter the value into memory.

Subsequent PNO recording will commence with the value now stored in memory.

**NOTE :** Once the PNO has been set up, the PNO will be backed up in the memory. However, if the tape is either ejected or entered into the BOT operation, it will be initialized.

## END ID recording

To record an END ID marker while in record mode, press the END ID key, on the front panel.

It takes nine seconds to record an END ID. During this time the word " END-ID " will blink on the LCD and the audio signal will be muted.

When an END ID is detected during playback, the word " END-ID " will appear on the LCD (nine seconds).

To locate an END ID, press the BLANK SEARCH key.

**NOTE:** If the PAUSE key is pressed while an END ID is being recorded, pause mode will be engaged, and the recorded END ID will be shorter than nine seconds. The blank search function may fail to read an END ID shorter than nine seconds.

## ERROR MARKS

### Recording error marks

ERROR MARKS are recorded in two ways: manually by pressing the ERR MARK key while recording, and automatically when either the PCM ERROR LED illuminates red or the OVER LOAD LED illuminates. When recording is finished, error marks can be located and the PCM audio aurally checked.

ERROR MARKS are allocated PNOs 700 to 799.

It takes nine seconds to record an ERROR MARK. During this time the symbol " ● " and the PNO will blink on the LCD.

If an ERROR MARK occurs while a START ID is being recorded, priority is given to the ERROR MARK. This can be changed, see soft function " [33] ID priority select ' ID Prior' ", on page 58.

When an ERROR MARK is detected during playback or F.FWD, the symbol " ● " will appear on the LCD (nine seconds) and the PNO is displayed.

To manually record an ERROR MARK, press the ERR MARK key while recording.

**NOTE:** If the STOP key is pressed while an ERROR MARK is being recorded, stop mode will be engaged, and the recorded ERROR MARK will be shorter than nine seconds. The ERROR MARK search function may fail to read an ERROR MARK shorter than nine seconds.

### Searching for error marks

The ERROR SEARCH keys are used to locate ERROR MARKS recorded on tape.

Press " ⏮ " to search in reverse, and " ⏭ " to search forwards.

When an ERROR MARK is detected, either PAUSE or PLAY mode can be engaged, see soft function " [41] Locate mode select ' Loc Mode' ", on page 58.

Soft function " [42] Error search key ' Srch Key' ", on page 59, can be set so that only ERROR MARKS are detected, or ERROR MARKS and START IDs.



## 9 Playback

### How to playback

Playback is started by pressing the PLAY key. Unlike conventional tape recorders playback is not paused using the pause key, but by pressing STOP.

Pressing the STOP key puts the PD-2 into pause mode, and the PAUSE key LED will illuminate. In pause mode the drum cylinder will rotate at normal play speed and the tape will be in contact with the drum.

Pressing the STOP key again will engage stop mode.

If the STOP key is repeatedly pressed, the PD-2 will toggle between pause and stop mode.

### Timecode

To set the TC frame rate during play, see soft function " [57] Replay TC frame select ' IEC Frame ' ", on page 62. If both TC formats have been recorded, IEC and FOSTEX, see soft function " [51] Output TC format select ' Out Form ' ", on page 61, to select which is to be output during playback.

**NOTE:** If only one TC format has been recorded on tape, and that format is not the same as the format currently selected by soft function " [51] Output TC format select ' Out Form ' ", on page 61, no TC will be output.

### Cue-ing

Cue mode allows you to monitor off tape during slow F.FWD and REW. The speed of the slow F.FWD and REW can be adjusted, see soft function " [46] Slow F.FWD, REW speed ' CueSpeed ' ", on page 59.

Press the CUE key, on the front panel, to use the CUE function. The word " CUE " will appear on the LCD.

To cancel CUE mode, press the CUE key again.

### Blank search

The Blank search function finds the last section of recorded tape, then engages pause mode immediately before it.

If there is an END ID recorded on tape, this will be located, then pause mode will be engaged immediately before the END ID. The END ID will be erased if recording is started at this point.

The blank search function is beneficial for the following reasons.

- 1) If A-TIME has been recorded up to the point found by the blank search, subsequent A-TIME recording will be continuous.
- 2) If a PNO can read up to the point found by the blank search, subsequent PNO recording will be continuous (if it cannot be read only the START ID will be recorded). This works only if the PNO SW is set to AUTO.
- 3) If internally generated TC has been recorded up to the point found by the blank search, subsequent INT TC recording will be continuous (this can be changed, see soft function " [53] INT TC Gen mode ' TC Gen ' ", on page 61).

If the internally generated TC is synchronized with EXT SYNC, the frame timing of subsequent INT TC recording will not be continuous.

## Locating to:

### A-time

Locate to a specified A-TIME value.

- 1) Press the A-TIME key. The A-TIME value previously entered will be displayed.
- 2) Use the " ◀ " and " ▶ ", cursor keys to select the pair of digits that you wish to change and the numeric key-pad to enter values. The currently selected digits will blink. If you make a mistake, press the CLR key to reset the currently selected pair of digits to 00. To quit out of this function, press the QUIT key.
- 3) With the desired A-TIME value on the display, press the EXEC key to locate to that A-TIME.

When the A-TIME point is found, the PD-2 will engage pause mode (this can be changed to play mode, see soft function " [41] Locate mode select ' Loc Mode ' ", on page 58).

### Timecode

Locate to a specified TC value (IEC TC format only).

- 1) Press the TC key. The TC value previously entered will be displayed.
- 2) Use the, " ◀ " and " ▶ ", cursor keys to select the pair of digits that you wish to change and the numeric key-pad to enter values. The currently selected digits will blink.

If you make a mistake, press the CLR key to reset the currently selected pair of digits to 00. To quit out of this function, press the QUIT key.

- 3) With the desired TC value on the display, press the EXEC key to locate to that TC.

When the TC is found, the PD-2 will engage pause mode (this can be changed to play mode, see soft function " [41] Locate mode select ' Loc Mode ' ", on page 58).

### Program numbers

Locate to a specified PNO.

- 1) Press the PNO key. The PNO previously entered will be displayed.
- 2) Use the, " ◀ " and " ▶ ", cursor keys to select the digit that you wish to change and the numeric key-pad to enter values. The currently selected digit will blink.

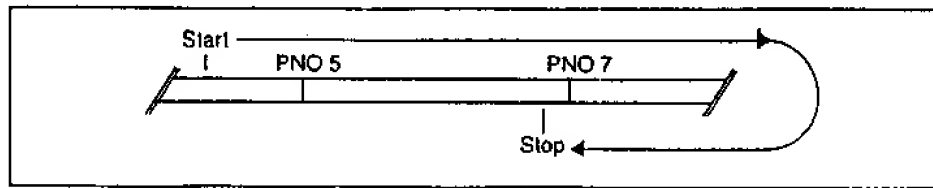
If you make a mistake, press the CLR key to reset the currently selected digit to 0. To quit out of this function, press the QUIT key.

- 3) With the desired PNO on the display, press the EXEC key to locate to that PNO.

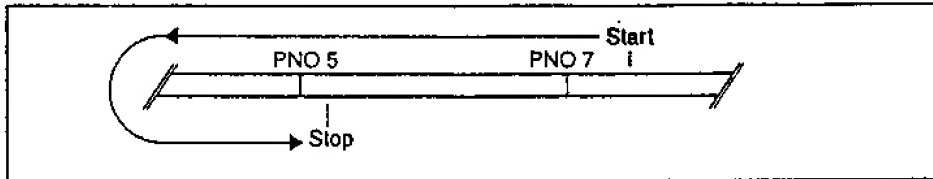
When the PNO is found, the PD-2 will engage pause mode (this can be changed to play mode, see soft function " [41] Locate mode select ' Loc Mode ' ", on page 58). Pause mode will be engaged nine seconds before the desired PNO, but the desired PNO will be shown on the LCD.

If the PLAY key is pressed while the PD-2 is searching for a PNO, Auto Play mode will be engaged, and the PLAY LED will flash. When the PD-2 finds the PNO, it will automatically start play.

The following examples explain what happens if the PNO being searched for is not recorded on tape.



In this example, PNO 6 is not recorded on tape. Locate was started before PNO 5. PNO 5 was read, but then PNO 7 was read, not PNO 6. The tape was then rewound to a position just before PNO 7 and pause mode engaged. " PNO 7 " is shown on the LCD.



In this case, PNO 6 is not recorded on tape, as before. Locate was started after PNO 7. PNO 7 was read, but then PNO 5 was read, not PNO 6. The tape was then forwarded to a position just before PNO 5 and pause mode engaged. " PNO 5 " is shown on the LCD.

## Mark 1 & Mark 2

Mark 1 & 2 are used to store A-TIME values during record or play, " On-the-Fly ". These stored A-TIME values can then be located by pressing the LOC.M1 or LOC.M2 key.

To store an A-TIME value as MARK 1, press the MARK1 key during record or play.

To locate to the currently stored MARK 1 value, press the LOC.M1 key.

When MARK 1 is found, the PD-2 will engage pause mode (this can be changed to play mode, see soft function " [41] Locate mode select ' Loc Mode ' ", on page 58).

The operation of MARK 2 is the same as for MARK 1, except you use the MARK2 and LOC.M2 keys.

## Editing Mark 1 & 2

- 1) Press the RCL key, then the MARK1 key. The currently stored MARK 1 A-TIME value will be displayed.
- 2) Use the, " ◀ " and " ▶ ", cursor keys to select the pair of digits that you wish to change and the numeric key-pad to enter values. The currently selected pair of digits will blink.  
If you make a mistake, press the CLR key to reset the currently selected pair of digits to 00. To quit out of this function, press the QUIT key.
- 3) With the desired A-TIME value on the display, press the EXEC key to store it. To edit the current MARK 2 A-TIME value, follow the above procedure, but use the MARK2 key.

## SKIP ID

The PD-2 cannot record SKIP IDs. However, it can detect SKIP IDs that have been recorded on tape, using other DAT recorders. When a SKIP ID is detected during play mode, the PD-2 will skip to the next START ID, then continue playing.

The PD-2 has a BOT record advance function, see soft function " [43] BOT record advance time ' BOT Draw ' ", on page 59. When this function is on, a SKIP ID is automatically recorded at the BOT (beginning of tape) and an audio-muted blank section is recorded for the time set by soft function [43]. This function is used because the beginning section of tape is sometimes " physically " distorted due to the tape splicing process used during DAT cassette manufacture.

When a tape that has been recorded using the BOT record advance function is played in a different DAT recorder, the SKIP ID will be detected as a standard DAT SKIP ID.

## 10 Other Functions

### Tape remaining

To check the remaining tape time (hour and minutes), during record or playback, press the REMAIN key. The A-TIME value will be replaced by the remaining tape time value. The word " A-TIME " will disappear from the LCD and the word " REMAIN " will appear. Press the REMAIN key again to return to A-TIME display.

The remaining tape time will not be displayed for 20 seconds when playback is started from the beginning of the tape. During this time, "-----" will be displayed.

**NOTE:** Because the remaining tape time is calculated using the SUPPLY REEL TACH PULSE cycle, accuracy will be low compared to A-TIME and TC. The accuracy of the tape remain function will be different when using thin 9  $\mu$ m-tape DAT cassettes. 13  $\mu$ m being the more common tape thickness.

### Displaying the current time & date

To display the current time and date, press and hold the DATE key (except in play mode, see below), the word " REAL TIME " will appear on the LCD. The currently set time and date values will be displayed in the fields shown below:

HH MM SS	TC field
MM DD	A-TIME field
YY	PNO field

When the DATE key is pressed during play mode, the DATE and TIME values recorded on tape in the SUB DATE PACK will be displayed. The YY value will blink to distinguish this display from the real time and date.

If the tape being played back was not recorded with SUB DATE PACK, the words " NO PACK " will blink on the LCD.

The real time and date information can be recorded in the SUB CODE AREA, see soft function " [30] DATE PACK record ' DatePack ' ", on page 57.

### Setting the time & date

- 1) Press the RCL key, then the DATE key. The currently set time and date values will be displayed in the fields shown below:

HH MM SS	TC field
MM DD	A-TIME field
YY	PNO field

- 2) Use the, "  $\triangleleft$  " and "  $\triangleright$  ", cursor keys to select the pair of digits that you wish to change and the numeric key-pad to enter values. The currently selected digits will blink. If you make a mistake, press the CLR key to reset the currently selected pair of digits to 00. To quit out of this function, press the QUIT key.

With the desired time and date on the display, press the EXEC key to store them.

The real time clock setting will be able to use time data from external TC. This data will be automatically set for HH, MM, SS only. YY, MM, DD information must be set manually.

- 1) Connect to external TC.
- 2) Press the RCL key and then the DATE key to enter real time clock setup mode.
- 3) Push the JAM switch. The external TC data are setup in the time section of the real time clock.

During this procedure, normal JAM will not be in operation.

## LCD reference markers

See soft function, " [10] REF marker position 'REF MKR' ", on page 55, to set the LCD reference marker position.

Typically, DAT recording headroom is 18dB. On the PD-2, the headroom can be changed by adjusting the maximum output level. Four settings are available: -18, -16, -14 and -12dB. The input and output amplifiers' gain is switched automatically.

For example, with the reference marker set to -18dB (+4dBu ref. record level), the maximum output level is +22dBu, so the headroom is 18dB. If the reference marker is set to -14dB (+4dBu ref. record level) the maximum output level is +18dBu, so the headroom is 14dB.

REFERENCE RECORD LEVEL	REFERENCE MARKER	MAXIMUM OUTPUT LEVEL
+4dBu	-18dB	+22dBu
	-16dB	+20dBu
	-14dB	+18dBu
	-12dB	+16dBu

**NOTE:** Make sure that the same reference marker setting is used for playback and recording. Otherwise the LCD bargraph meter reading will be different. Use the slate tone to record a reference signal level at the beginning of the tape.

## Internal light

The LIGHT SW switches on two lights: The LCD side light, making the LCD clearly visible in poor lighting, and the cylinder drum light, allowing inspection of the cylinder drum. Also, the amount of tape remaining can easily be viewed.

The LIGHT SW is a three position switch: centre OFF, up momentary ON and down latched (HOLD) ON.

## LCD contrast adjustment

The LCD CONT control adjusts the contrast of the LCD display.

The contrast adjustment allows you to optimize the readability of the LCD when it is viewed from different angles.

## 11 Soft Function Modes

Soft functions are PD-2 functions whose settings are stored in memory. The current settings of all the soft functions can be stored in five user memories. The default (factory) settings are shown in "Soft function table", on page 65, and these can be recalled at any time. See, "Setup functions", on page 54, for saving and recalling memory setups.

**NOTE:** Soft function settings cannot be recalled individually, when a user memory, or the default settings are recalled all soft functions are set.

### Selecting a soft function

In the function mode of "10-03", the first two numbers represent the mode type while the last two numbers represent its setup option.

1. Press BATT key, while pressing CLR key.

"Fnc" will be displayed in the A-Time area and the mode number will be blinking. In addition, the option number currently set by mode number will be displayed in the PNO area.

The mode number displayed here is the previously set mode.

2. Select the mode number to be set or confirmed.

There are two methods to do this.

- (1) The number may be directly input via the keypad. This number will be "00" when CLR key is pressed.
- (2) Scroll with the "◀" or "▶" keys.

In either case, the mode number in the A-Time area will continue to blink and its mode name will be shown in the TC area. The option number of this mode will be shown in the PNO area.

3. When the mode number is blinking:

- (1) The mode number is set by pressing EXEC key and the option number will blink in the PNO area. Additionally, the option name will be shown in the TC area.
- (2) When QUIT key is pressed, the PD-2 will exit from the function mode and return to the normal display.

## 4. Selecting option numbers.

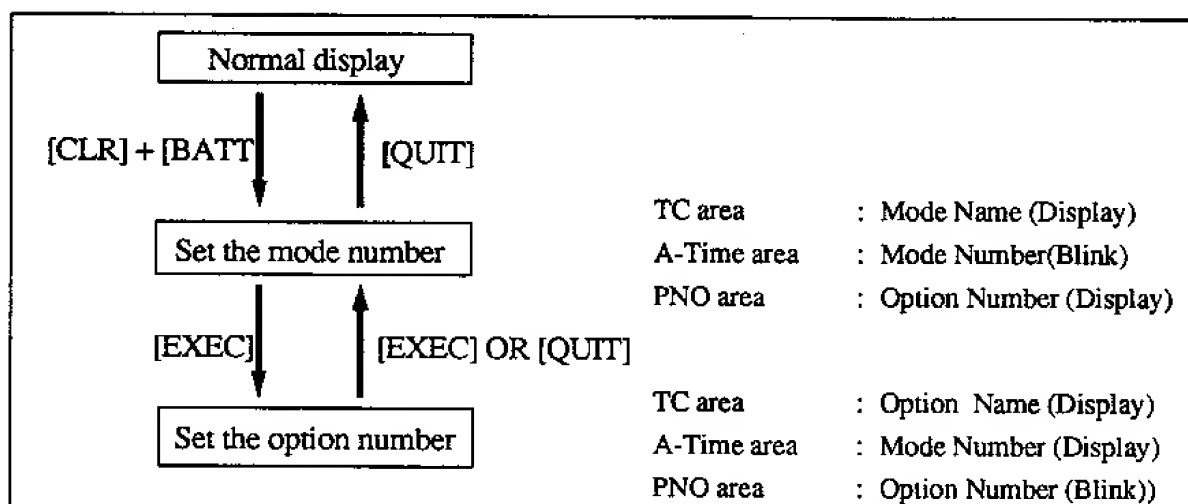
Option numbers may be selected by direct key input via the keypad or by scrolling with the "◀" "▶" keys. The option name will be shown in the TC area while the option number remains blinking.

## 5. When the option number is blinking:

- (1) Press EXEC Key to register the option number that has been changed. This returns the PD-2 to condition 2 above. It is then possible to set or confirm the next function.
- (2) When the QUIT key is pressed, the PD-2 will return to condition 2 above without registering the option number that has been changed. It is then possible to set or confirm the next function.

## 6. Exiting the function mode.

To exit from the function mode, press QUIT key while the mode number is blinking.



## Function description

In the following text, the word to the right of each soft function heading is the word that will appear on the LCD when that particular function is selected, for example, "Version".

\* This symbol is used to indicate the default option.

## Setup functions

### [01] Display the ROM version "Version"

Display ROM version.



**[02] Save user memory " SaveStup "**

Soft function settings can be saved in one of five user memories.

Enter the function, then select a memory number from one to five. Pressing the EXEC key will save all the current soft function settings in the selected user memory.

**[03] Recall user memory " LoadStup "**

Recall one of the five user memories.

Enter the function, then select a memory number from one to five. Pressing the EXEC key will restore all the current soft function settings from the selected user memory.

**[04] Recall default setup " Mem Rst "**

Recall the default (factory) settings for all soft functions. See " Soft function table " , on page 65.

Enter the function, pressing the EXEC key will restore the default soft function settings. To cancel the function press the QUIT key.

**Alarm tone functions****[05] Battery alarm " Batt ALM "**

- \* 00 : Output the alarm tone to the headphones when the battery voltage is between 10 and 11Volts and when it exceeds 16Volts.
- 01 : Do not output the alarm tone to the headphones.

**[06] PCM Error Tone "ERR Tone"**

Error tone, when a PCM error occurs (BER = 10%), can be setup.

- \* 00 : Error tone is sounded at both record and playback.
- 01 : Error tone is sounded in the record mode and not in the playback mode.

**Head operating elapsed time function****[07] Head operating Elapsed Time "Head Time"**

The cumulative drum head operating time will be displayed in hour units via setup of soft function 07 and then pressing the EXEC key.

**NOTE :** The meaning of head operating time is the total length of time the drum head is rotating.

**Audio functions****[10] REF marker position " REF MKR "**

Set the position of the LCD reference marker.

- 00 : -18dB
- 01 : -16dB
- 02 : -14dB
- \* 03 : -12dB

**[11] Muting level " Mute Lvl "**

Set the BER (Block Error Rate) level at which the audio output shall be muted.

- 00 : No muting
- 01 : BER > 25%
- 02 : BER > 50%
- \* 03 : BER > 75%
- 04 : BER > 87.5%

**[12] Phantom power voltage select " Phantom "**

Set the phantom power voltage of the P48 position.

- \* 00 : 48V
- 01 : 12V

**[13] Cue attenuation " Cue Att "**

The amount of attenuation applied to the monitor signal during CUE mode.

- \* 00 : -12dB
- 01 : 0dB

**[14] Limiter link select " Lim Link "**

Link CH1 and CH2's limiter circuits.

- 00 : LINK OFF, CH1 and CH2's limiters work independently.
- \* 01 : LINK ON, if one channel's limiter operates, the other channel's operates too.

**Dital IN/OUT functions****[20] Digital output format " Dig Out "**

Select the Digital output format.

- \* 00 : AES/EBU (IEC 958 Broadcasting studio use).
- 01 : IEC 958 Consumer use (SP DIF).

The DIGITAL IN connection automatically switches to either AES/EBU (IEC 958 Broadcasting studio use), or IEC 958 Consumer use (SP DIF).

**[21] Digital input word sync select " Dig SYNC "**

Select the word sync source when using the DIGITAL IN connection.

- \* 00 : DIGITAL IN connection.
- 01 : WORD IN connection.

**NOTE:** If option 01 is selected, but there is no WORD IN connection, INT word sync mode will be engaged.

**[22] START ID recording select " Dig S-ID "**

Record START IDs when digital copying.

- \* 00 : START IDs are not recorded when digital copying. START IDs are processed as users bit.
- 01 : START IDs are recorded when digital copying.

**[23] Sync detect time of DIGITAL Input connection " DigToler "**

- \* 00 : Normal detect time.
- 01 : The PD-2 will detect the sync signal pattern of the digital signal appearing at the DIGITAL input connection for about 2 seconds. This setting is useful when connecting to a " Consumer Format " DAT machine that has a phono/RCA jack type connection. It can also be used when the PD-2 is receiving a " dirty " DAT signal, one with dropouts, etc.

**LCD functions****[25] Bargraph peak hold time " PeakHold "**

Set the LCD bargraphs peak hold time.

- 00 : OFF (no hold).
- \* 01 : 0.6 sec.
- 02 : 3 sec.
- 03 : MANUAL RESET using the CLR key.

NOTE: When using option 03, if you press the CLR and BATT keys to edit a soft function, the peak hold display will be reset.

**[26] Error rate display " Err Rate "**

Display the BER on the A-TIME field on the LCD.

- \* 00 : OFF (no display).
- 01 : BER (%) by C1 of the PCM area.
- 02 : BER (%) by C1 of the SUB CODE area.
- 03 : BER (%) by C2 of the PCM area.
- 04 : The total number of block errors by C1 and C2 of the PCM area and C1 of the SUB CODE area. The number of errors will be displayed as " E0000 ", the maximum being 4096.

**ID functions****[30] DATE PACK record " DatePack "**

Record " real time " time and date information in the SUB CODE AREA, (PACK ITEM = 0101).

- \* 00 : Real time and date information is always recorded.
- 01 : Not recorded.

**[31] END ID record " EndIdRec "**

Automatically record an END ID when recording is stopped. When recording is stopped, the PD-2 will continue operating for about nine seconds while the END ID is written.

- \* 00 : Not recorded.
- 01 : Recorded.

**NOTE:** Option 01, an END ID will also be recorded when REC/PAUSE mode is automatically cancelled (see soft function " [40] Pause cancel time " PAUSE TM " ", on this page 58).

**[32] SLATE ID record " Slate ID "**

Record a START ID when the SLATE MIC/TONE function is used.

- \* 00 : OFF.
- 01 : Record START ID when the SLATE MIC is used.
- 02 : Record START ID when the SLATE TONE is used.
- 03 : Record START ID if either SLATE TONE or MIC are used.

**[33] ID priority select " ID Prior "**

Specify recording priority when a START ID and an ERROR MARK occur simultaneously, or turn off automatic ERROR MARK recording.

- 00 : ERROR MARK has priority.
- \* 01 : START ID has priority.
- 02 : ERROR MARKS are not recorded automatically.

## Tape transport functions

**[40] Pause cancel time " PAUSE TM "**

Set the automatic pause release time.

- 00 : 30 sec.
- 01 : 1 min.
- 02 : 2 min.
- \* 03 : 3 min.
- 04 : 4 min.
- 05 : 5 min.
- 06 : 10 min.
- 07 : 20 min.

**[41] Locate mode select " Loc Mode "**

Select the tape transport mode to be engaged when location points are found.

- 00 : PLAY.
- \* 01 : PAUSE.

**[42] Error search key " Srch Key "**

Set the ERROR SEARCH keys mode.

- \* 00 : Search for only ERROR MARKS.
- 01 : Search for ERROR MARKS and START IDS.

**[43] BOT record advance time " BOT Draw "**

Set the automatic BOT (Beginning of Tape) time advance.

When recording on a new tape, a SKIP ID will be recorded at the beginning of the tape and an audio-muted blank section will be recorded for the period specified by this function, then stop mode will be engaged.

This function is desirable because sometimes the start and end sections of the tape are distorted due to the splicing process used when the DAT cassette is manufactured.

Recording on this section of tape will produce a high BER.

This function only works at the beginning of the tape, so care must be taken when recording towards the end of the tape.

- \* 00 : OFF.
- 01 : 20 sec.
- 02 : 40 sec.
- 03 : 60 sec.

**[44] SKIP ID " Skip ID "**

SKIP ID detection mode.

- 00 : Ignore SKIP ID.
  - \* 01 : When a SKIP ID is detected, the tape is fast wound to the next START ID, and playback is continued.
- See " SKIP ID ", on page 50, for details about how the PD-2 treats SKIP IDs.

**[45] END ID stop " EndIdStp "**

END ID detection mode.

- \* 00 : Ignore END ID.
- 01 : Stop when an END ID is detected.

**[46] Slow F.FWD, REW speed " CueSpeed "**

Set the slow fast forward and slow rewind speed.

- 00 : 2x play speed.
- 01 : 3x play speed.
- \* 02 : 5x play speed.
- 03 : 9x play speed.
- 04 : 16x play speed.

**[47] MARK 2 key locate select "LocateM2"**

Set the operation of the LOC.M2 key.

- \* 00 : Locate to MARK 2 (normal mode).
  - 01 : Locate to the position that PLAY was last started from.
  - 02 : Locate to the position that REC was last started from.
  - 03 : Locate to the position that REC or PLAY was last started from.

**[48] Transport Operation Select at Detection of dew "Dew Mode"**

Select whether or not the transport should be forced to stop at detection of dew.

- \* 00 : AUTO STOP
 

When dewing occurs, "DEW" will light, and operation will be forced into the STOP mode. The internal heater will automatically switch on. Additionally, the transport will not function until the dew sensor has been shut off automatically.
- 01 : NON STOP
 

The transport may be operated even though dewing has been detected and "DEW" blinks.

NOTES : 1) Func 48 will be set to "00" at switch on of power with no memory backup.

2) When "DEW" is blinking (Func 48-01), the transport may be operated regardless of dew being present in the transport. Therefore, extreme caution in operation should be used as the tape can be mishandled or destroyed.

3) When the PD-2 is brought into a warm environment from a cold one, i.e., from the outdoors into a warm room, it may require several minutes for the dew sensor to detect moisture in the transport. In this case, care must be taken not to operate the PD-2 for a few minutes in case dew has formed.

**[49] REC PAUSE Operation "Rec End"**

Operation of the transport when the PAUSE key is pressed during the RECORD mode, may be setup.

- 00 : After pressing the PAUSE key, two seconds of tape is rewound and the recorder enters PAUSE mode.
- \* 01 : After pressing the PAUSE key, recording continues for two seconds, the tape is rewound to the position where the PAUSE key was pressed, and the recorder enters the PAUSE mode.

## TC Functions

### [50] TC format " RecForm "

Select the TC recording format.

- 00 : OFF (no TC is recorded)
- 02 : FOSTEX format
- \* 03 : IEC and FOSTEX format

### [51] Output TC Format Select "Out Form"

Select the TC format that is to be output when both IEC and Fostex formats have been recorded.

- \* 00 : IEC Format
- 01 : Fostex Format
- 02 : Internal TC Generator

In Func 51-00 and Func 51-02, by pressing the U-BIT key, time code users bit information recorded in the pro binary pack of the tape will be shown on the TC display area of the LCD.

**NOTE:** If only one TC format has been recorded on the tape, and the format is not the same as the format currently selected via this setting, no TC will be output.

### [52] Drop frame select " Mode DF "

Select DROP FRAME for 29.97 or 30 TC format.

- \* 00 : Drop frame.
- 01 : Non drop frame.

### [53] INT TC Gen mode " TC Gen "

Select the TC mode to be used when recording is restarted from either STOP mode or REC PAUSE mode.

- 00 : Rec Run
 

When recording is started, the PD-2's internal TC generator jam syncs to the TC that was recorded on tape just before recording was last stopped. In this mode, the TC recorded on tape is continuous even though recording has been repeatedly started and stopped.
- 01 : Eliminated
- \* 02 : Free Run
 

The internal TC generator will continue counting (error  $\pm 1$  frame) even if the power is switched off. Also, if the power is switched off during jam sync and then switched on again, and continuity of the internal TC has been obtained, "JAM" will be shown on the LCD.

**03 : RTC Tm**

At switch on of power, RTC time will be directly set in the internal TC generator (error  $\pm 1$  frame for RTC).

**NOTE:** When "Func 53-02: Free run " is selected, if FRAME RATE switch is changed during power off, when the PD-2 is switched on the internal TC generator will restart from [00H:00M:00S:00F]

**[54] TC drop out compensation " TC Drop "**

TC reader compensation for drop out of the EXT TC.

00 : OFF.

\* 01 : Compensate for 4 frames of dropout.

02 : Compensate for 8 frames of dropout.

**[55] TC sync mode " TC Sync "**

Sync the INT TC generator to the TC sync signal of the connected EXT TC. The TC sync signal being, the sync word (bits) contained in each 80-bit TC frame.

\* 00 : OFF.

01 : Sync with the TC sync signal of the connected EXT TC.

**[56] TC delay " TC delay "**

Compensate the TC signal for the delay occurring in the DA convertor.

00 : TC delay OFF (output the TC relative to the DIGITAL OUT timing).

\* 01 : TC delay ON (output the TC relative to the ANALOG OUT timing).

**[57] Replay TC frame select " IECFrame "**

Select the TC frame rate to be produced during playback.

\* 00 : AUTO

01 : 30 fps

02 : 29.97 fps (NDF)

03 : 29.97fps (DF)

04 : 25 fps

05 : 24fps

06 : 30fps (DF)

**NOTES:**

- 1) When external TC is output at simultaneous record/play and 30 drop frame is output in the above mode, input and output times will be separate.
- 2) When external input time code that is 30 drop frame, it is not possible to record.
- 3) Modes in which 30 drop frame cannot be used:
  - (1) When  $F_s = 44.056$  KHz.
  - (2) When the external sync signal is other than 30 Hz.
  - (3) In the JAM sync mode.



**[58] Fast wind TC select " Wind TC "**

Select the TC output mode for fast and slow F.FWD and REW. During slow and fast F.FWD and REW, the off tape timing information, used to generate the TC, will not be continuous.

- \* 00 : At any point that the TC can be read, five or more continuous frames of TC will be output. This option can be used with the Fostex 4030 Synchronizer, which can read the TC, if it receives five or more frames of continuous TC.
- 01 : TC is output only if, and when it can be correctly read.
- 02 : No TC is output during slow and fast F.FWD and REW. TC is only output during record and play.

**[59] Pause TC select " Pause TC "**

Select the TC output while in PAUSE mode.

- 00 : TC is not output in pause mode.
- \* 01 : TC is output in pause mode.

**[60] Reverse TC select " Rev TC "**

TC output frame data format when tape is travelling in the opposite direction.

- \* 00 : Normal frame data format.
- 01 : Reverse order frame data format.

**[61] TC U-bit " TC Ubit "**

The following information can be recorded as the U-Bit (users bit) in the PRO BINARY PACK of the SUB DATA area.

- 00 : U-Bit data of EXT TC is recorded when recording EXT TC, and (00, 00, 00, 00) will always be recorded in the case of INT TC.
- 01 : Real time clock (YY, MM, DD, HH).
- 02 : Real time clock (MM, DD, HH, MM).
- 03 : real time clock (DD, HH, MM, SS).
- \* 04 : Four random input figures (XX, XX, XX, XX)
- 05 : Real time clock and one random input figure (YY, MM, DD, XX)
- 06 : Real time clock and one random input figure (MM, DD, YY, XX)
- 07 : Real time clock and one random input figure (DD, MM, YY, XX).
- 08 : The EXT TC U- Bit data will be JAM synchronized when JAM is entered and the U-Bit data on the tape will be held in the REC RUN mode. (00, 00, 00, 00) will be recorded in other cases.

Random figure data are input by pressing the RCL key and then the U-Bit key.

- NOTES:**
- 1) Figure [X] input as a random figure will be backed up in memory.
  - 2) This function is effective only in the IEC format.

## Others

### [65] Sync out select " Sync Out "

SYNC OUT connection signal type. Option "00" will automatically select the mode depending on the current mode, either 01, 02 or 03. Modes 01, 02 and 03 fix the sync output signal to one type.

\* 00 : AUTO

01 : Video frame sync pulse used internally by the PD-2(decay sync pulse width about 20ms)(See "SYNC OUT", on page 32).

02 : DAT frame sync used for the record head.

03 : DAT frame sync used for the play head.

## Soft function table

\* indicates default set up.

No.	FUNCTION DESCRIPTION	SETTING DESCRIPTION	USER SETUP				
			1	2	3	4	5
01	Display ROM version	Display the ROM version number					
02	Save user memory	Save the user settings in one of the five user memories					
03	Recall user memory	Recall one of the five memories					
04	Recall default setup	Recall the default (factory) setting for all soft functions					
05	Battery alarm	*00 Output to headphones					
		01 No output					
06	PCM Error Tone select	*00 Both of Rec and play mode					
		01 Rec mode only					
07	Head operating time display	Display the time of Drum Head Rotation					
10	REF marker position	00 -18dB: LCD reference marker position					
		01 -16dB:					
		02 -14dB:					
		*03 -12dB:					
11	Muting level	00 No muting: audio output is not muted					
		01 BER>25%: audio output is muted when BER>25%					
		02 BER>50%					
		*03 BER>75%					
		04 BER>87.5%					
12	Phantom power voltage select	*00 +48Volts					
		01 +12Volts					
13	Cue attenuation	*00 -12dB: monitor level is attenuated while cueing					
		01 0dB: no attenuation					
14	Limiter Link Select	00 Link off					
		*01 Link on					
20	Digital output format	*00 AES/EBU (IEC958 Broadcasting studio use)					
		01 IEC958 Consumer (SPDIF)					
21	Digital input word sync select	*00 DIGITAL IN: use word sync from DIGITAL INPUT					
		01 WORD IN: use word sync from WORD INPUT					
22	START ID recording select	*00 Not recorded when digital copying					
		01 Recorded when digital copying					
23	Sync detect time	*00 Normal time					
		01 About 2 seconds					
25	Bargraph peak hold time	00 OFF (no hold)					
		*01 0.6sec.					
		02 3sec.					
		03 Manual reset					
26	Error rate display	*00 OFF (no display)					
		01 BER of C1 of the PCM area					
		02 BER by C1 of the SUB CODE area					
		03 BER by C2 of the PCM area					
		04 BER by C1 and C2 of the PCM area and C1 of the SUB CODE area (total of 01, 02 and 03)					
30	DATA PACK record	*00 Real time and data information is always recorded					
		01 Not recorded					
31	END ID record	*00 No END ID is recorded when STOP mode is engaged					
		01 An END ID is recorded					

## Soft function table

No.	FUNCTION DESCRIPTION	SETTING DESCRIPTION		USER SETUP				
				1	2	3	4	5
32	START ID record	*00	OFF					
		01	A START ID is recorded when the slate MIC is used					
		02	A START ID is recorded when the slate TONE is used					
		03	A START ID is recorded if either the slate MIC or TONE is used					
33	ID priority select	00	ERROR MARK recording has priority over START ID					
		*01	START ID recording has priority over ERROR MARK					
		02	ERROR MARKS not recorded automatically					
40	Pause cancel time	00	30 sec: pause mode auto-cancel time					
		01	1 min.					
		02	2 min.					
		*03	3 min.					
		04	4 min.					
		05	5 min.					
		06	10 min.					
		07	20 min.					
41	Locate mode select	00	PLAY MODE is engaged when location points are found					
		*01	PAUSE MODE					
42	Error search key	*00	Search for only ERROR MARKS					
		01	Search for ERROR MARKS and START IDs					
43	BOT record advance time	*00	OFF					
		01	20 sec: auto record advance time					
		02	40 sec:					
		03	60 sec:					
44	SKIP ID	00	Ignore SKIP IDs					
		*01	F.FWD to the next START ID when a SKIP ID is detected					
45	END ID stop	*00	Ignore END ID					
		01	Stop when an END ID is detected					
46	Slow F.FWD, REW speed	00	2x: Slow F.FWD & REW is 2x play speed					
		01	3x:					
		*02	5x:					
		03	9x:					
		04	16x:					
47	MARK 2 key locate select	*00	Locate to MARK 2 (normal mode)					
		01	Locate to the position that play was last started from					
		02	Locate to the position that recording was last started from					
		03	Locate to the position that recording, or playback was last started from					
48	Transport operation select at dewing	*00	Stop automatically					
		01	Transport isn't stopped automatically					
49	Rec Pause operation	00	Pre Roll					
		*01	Post Roll					
50	TC foarmat	00	OFF					
		01	IEC: record TC using the IEC format					
		02	FOSTEX: record TC using the FOSTEX format					
		*03	IEC & FOSTEX: record both formats					

## Soft function table

No.	FUNCTION DESCRIPTION	SETTING DESCRIPTION	USER SETUP				
			1	2	3	4	5
51	Output TC format select	*00 IEC format					
		01 FOSTEX format					
		02 INT TC Generator					
52	Drop frame select	*00 Drop frame ON					
		01 Drop frame OFF					
53	INT TC GEN mode	00 Rec Run					
		*02 Free Run					
		03 RTC Tm					
54	TC drop out compensation	00 OFF					
		*01 Compensate for 4 frames of EXT TC dropout					
		02 Compensate for 8 frames of EXT TC dropout					
55	TC sync mode	*00 OFF					
		01 The INT TC generator is synced to the EXT TC					
56	TC delay	00 TC is output relative to the DIGITAL OUT timing					
		*01 TC is output relative to the ANALOG OUT timing					
57	Replay TC frame select	*00 AUTO: Output the frame rate that is recorded on tape					
		01 30fps: The frame rate to be output during playback					
		02 29.97fps:(NDF)					
		03 29.97fps:(DF)					
		04 25fps:					
		05 24fps:					
58	Fast wind TC select	06 30fps(DF)					
		*00 If TC is read, 5 continuous frames are output					
		01 Only TC that can be read is output					
59	Pause TC select	02 No TC is output					
		00 TC is not output in pause mode					
60	Reverse TC select	*01 TC is output in pause mode					
		*00 When the tape is travelling in reverse, the TC is output in the normal order					
61	TC Ubit	01 When the tape is travelling in reverse, the TC is output in reverse order					
		00 (00,00,00,00) is recorded using INT TC. BINARY GROUP DATA of the EXT TC is recorded using EXT TC.					
		01 Real time clock ( YY.MM.DD.HH )					
		02 Real time clock ( MM.DD.HH.MM )					
		03 Real time clock ( DD.HH.MM.SS )					
		*04 Four random input figures ( XX,XX,X,XX )					
		05 Real time clock and one figure ( YY,MM,DD,XX )					
		06 Real time clock and one figure ( MM,DD,YY,XX )					
		07 Real time clock and one figure ( DD,MM,YY,XX )					
65	Sync out select	08 Jam Int.					
		*00 AUTO					
		01 Video frame sync pulse used internally by the PD-2					
		02 DAT frame sync used for the record head					
		03 DAT frame sync used for the play head					

## 12 Error Messages

### PCM ERROR LED

The PCM ERROR LED will illuminate under the following circumstances:

#### **GREEN** illumination:

When the average BER value of eight frames for C1 exceeds 1%. The LED will remain illuminated for about 8 frames (about 240ms).

The LED will remain illuminated under a continuous error.

#### **RED** illumination:

When the average BER value of eight frames for C1 exceeds 10%. The LED will remain illuminated for about 8 frames (about 240ms).

The LED will remain illuminated under a continuous error.

### PCM error display

The PCM ERROR LED lights for a short time only, so you may not notice it. Therefore, when the PCM ERROR LED lights RED (10% average BER), the word "PCM ERR" will blink on the LCD, until it is reset using the MESSAGE RESET SW.

<p><b>NOTE:</b> If the "PCM ERR" message cannot be reset, check the connecting cables and the PD-2's settings. If you cannot remedy the problem, please contact your Fostex dealer or service centre.</p>
---

### Audio muting

The audio outputs will be muted under the following conditions:

When the average value of BER for C1 over one frame, two fields exceeds 75% (see soft function "[11] Muting level "Mute Lvl"", on page 56). The LED will remain illuminated for one frame, two fields (about 30ms).

### Resetting the error message display

To clear an error message from the LCD, push the MESSAGE RESET SW up, and then release it.

## Alarm tone

The alarm tone will be output to the monitor speaker and the headphones under the following conditions.

The alarm tone consists of three 0.5 sec bursts of a 1kHz tone.

**NOTE:** If the MON level and the PHONES level controls are turned fully anticlockwise, the alarm tone will not be heard. Also, the ERR TONE SW must be set to the ON position for the alarm tone to be heard.

## Power supply conditions

The following applies to both battery and AD-15 adaptor operation.

If the power supply voltage is between 10V-11V, or above 16V, the alarm tone will be output to the headphones, every 15 seconds.

In this case, the alarm tone output to the headphones can be switched on and off independently of the ERR TONE SW, see soft function "[05] Battery alarm "Batt ALM"", on page 55.

## Input amplifier clipping

If clipping occurs in either CH1 or CH2's input amplifier the error tone is output to the internal speaker and the headphones. See also, "Overload indicator", on page 39.

## PCM error

When the average BER value of eight frames for C1 exceeds 10%. The alarm tone will sound. See also, "PCM ERROR LED", on page 68.

## External sync

When an EXT sync source is first connected to the EXT SYNC connector, before the PD-2 locks onto the EXT sync, the words "INT CLK", "VIDEO", "DAT-F" and "TC" will blink on the LCD for five seconds and the alarm tone will sound. See also, "SYNC IN", on page 30.

## Timecode dropout

If, during recording, the EXT TC drops out, the INT generator will free-run for a predetermined time, see soft function "[54] TC drop out compensation "TC Drop"", on page 62. If drop out exceeds this period, the alarm tone will be heard and TC will not be recorded on tape. See also, "Frame rate selection", on page 41.

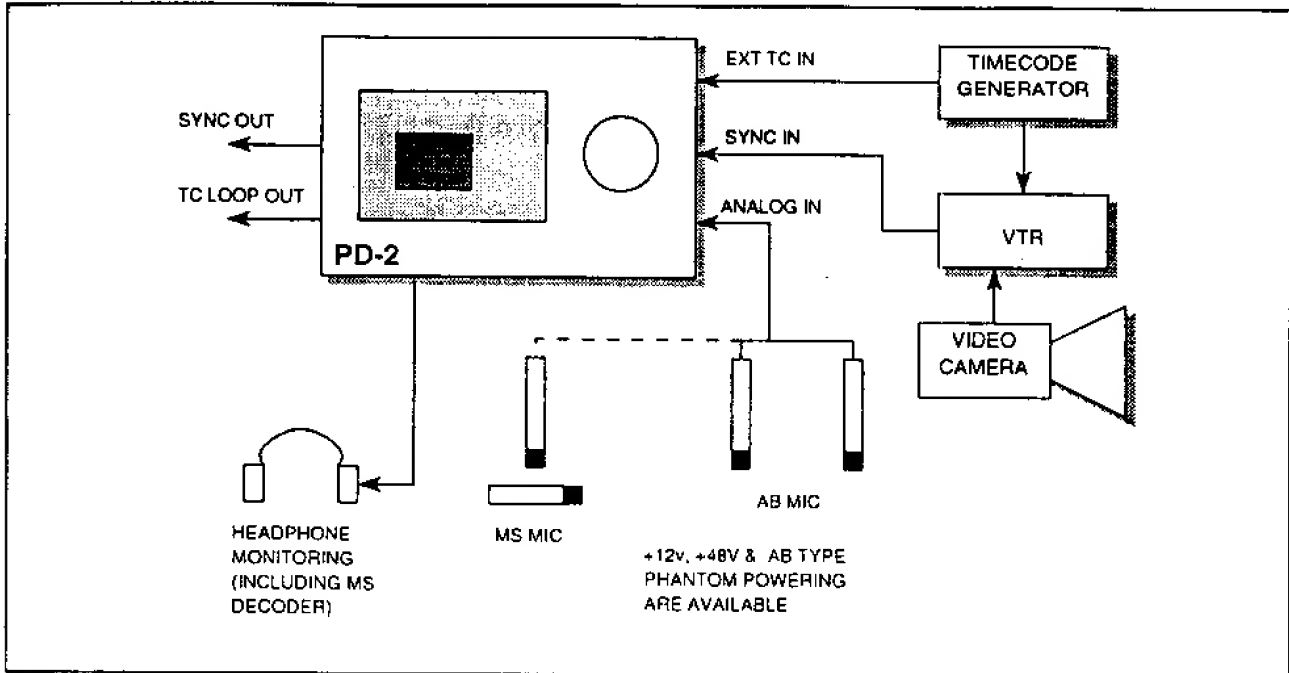
## 13 Typical System Configurations

With a unit as versatile as the PD-2, it is impossible to describe every possible configuration.

Virtually any application demanding DAT recording can make use of the PD-2.

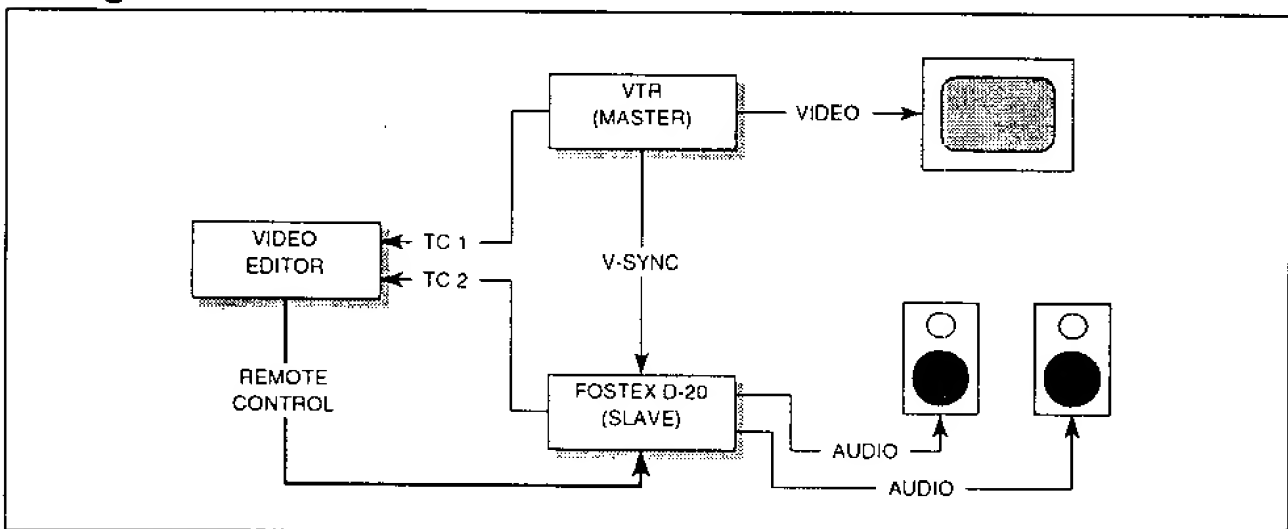
However, the following system configurations show specific applications that the PD-2, using its unique features, has been designed to fulfil.

### Locating recording



The JAM function can be used to synchronize the INT TC generator to the EXT TC and video sync signal. Once synchronization is achieved, the EXT TC and video signal can be disconnected, providing the camera operator and sound technician greater freedom of movement.

### Editing



In this system, a location recording was made using the PD-2, and now the tape has been transferred to the Fostex D-20 for editing. The PD-2 cannot be used as a slave machine, because it does not have a pitch control function.

However, the PD-2 could be used as the master and the VTR used as the slave.

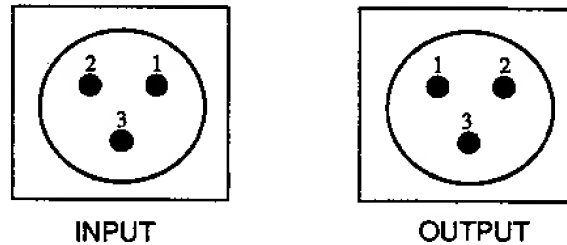


## 14 Specifications

### Input/Output connector pin assignments

#### XLR

The XLR type connectors are wired as shown below.



#### XLR Wiring

1	GND
2	HOT
3	COLD

To maintain signal phase integrity, always check the XLR wiring details of the equipment you are using.

When the PD-2 is connected to equipment with unbalanced inputs, use the GND and HOT pins, or the GND and COLD pins.

The unused pin can be either left open or connected to GND, in either case, the performance of the PD-2 is not affected. However, with a pin left open, the output level will be 6dB lower. If this is a problem, connect the unused pin to GND.

All the TC connections are balanced, so use three-core XLR type cables.

On the digital connections, there is no difference between the signal appearing at pins 2 and 3.

#### HEADPHONES

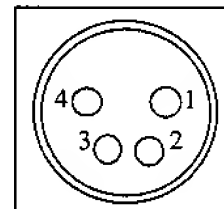
The stereo headphone connection is wired: CH1-TIP, CH2-RING and GND - SLEEVE.

#### DC IN

The DC IN connector is wired as follows.

1	GND
2	NC
3	NC
4	+12 ~ 16V

DC IN (XLR-4)



**NOTE:** Great care should be exercised with regard to the power supply polarity and voltage as any error may seriously damage the PD-2.

## Remote Controller Connection to the MINI DIN Connector

The main unit can be remote controlled by connecting the remote controller to the rear panel MINI DIN connector.

### Operating Mode

1	PLAY	5	SHIFT
2	STOP	6	REW
3	REC	7	VBATT(+12-16V)
4	GND	8	FF

The following operations will be executed by connecting each PIN No. to GND.

PLAY, STOP, REC, REW, FF.....Identical to the main keys  
 SHIFT + PLAY .....SLATE TONE Switch  
 SHIFT + STOP .....S-ID switch  
 SHIFT + REC.....PAUSE key  
 SHIFT + REW .....ERROR SEARCH REW  
 SHIFT + FF .....ERROR SEARCH FF

#### NOTES:

- 1)In using pin no. 7 "VBATT", be careful not to short circuit it or exceed its capacity (max 400 mA).
- 2)Should the remote controller and main unit switches be pressed at the same time, operation priority will be given to the button pressed first.

## Technical specifications

### General

Recording format	PRO DAT, IEC standard (DIS)
Tape used	DAT Tape (Metal)
Number of channels	Audio x2
	Timecode x1
Recording time	120 minutes (using 120min tape)
Cylinder head	4-head (Sendust Sputter)
	30mm dia, 2000 rpm
Error correction	Double Reed-Solomon code
Track pitch	13.6mm
Sampling frequency	48kHz, 44.1kHz, 44.056kHz
Modulation type	8-10 conversion
Transfer rate	2.4Mbit/sec
Quantization	16 bit linear
Emphasis	50 $\mu$ s & 15 $\mu$ s
Copy guard	No guard
Motor construction	
Cylinder	Direct drive motor x 1
Capstan	Direct drive motor x 1
Reel	Direct drive motor x 2
Mechanism	Attached DC motor x 1
Power supply	DC 12.0 - 16.0V
Ni-Cd battery	NP-1B or equivalent
Alkali battery	10 x "C" size HP2
Power supply	AD-15 adaptor (optional)
Power	Approx 27W consumption
Battery life	Approx 70 minutes (using NP-1B or equivalent)
Operating environment (performance guaranteed)	
Temperature	0 °C - + 45 °C
Humidity	30% - 60%
Power supply	12.0 - 16.0V
Operating environment (performance not guaranteed)	
Temperature	-10 °C - + 50 °C
Humidity	Less than 80%
Power supply	12.0 - 16.0V
Dimensions	307(W) x 96(H) x 216(D)
Weight	4.2kg

### Mechanical

Tape speed	8.15 mm/sec $\pm$ 0.5%
Rewind time	90 seconds or less for a 120 min tape
Search speed	100x play speed (average)
Rolling torque	8 - 15g-cm
FREV torque	25g-cm or more
Back tension torque	6 $\pm$ 1.5 g-cm
Pinch roller pressure	200 $\pm$ 50g
Tape loading time	3.5 sec or less
Play start time	0.8 sec (pause to start)
	1.4 sec (stop to start)

## Input & Output

<b>Analog input</b> Connector Microphone Standard input Min input Max input MIC impedance Input impedance Phantom power Line Standard input Min input Max input Input impedance <b>Analog output</b> Standard output Max output  Load impedance Output impedance Connector <b>Digital input</b> Data format Transfer rate Input impedance Minimum input level Connector <b>Digital output</b> Data format Transfer rate Output impedance Output level Load impedance Connector <b>Timecode input</b> Standard level Transfer rate Minimum input level Input impedance Connector <b>Timecode output &amp; TC LOOP OUT</b> Standard level Transfer rate Minimum load impedance Output impedance Connector <b>Headphone output</b> Load impedance Max output Connector	XLR-3-31 type  -60dBu -70dBu -28dBu < 600 $\Omega$ > 10k $\Omega$ Electronic Balance (Phantom OFF) P-48, T-12  +4dBu -6dBu +36dBu > 20k $\Omega$ Electronic balance (Phantom OFF)  +4dBu +22dBu (Ref marker: -18dB) +20dBu (Ref marker: -16dB) +18dBu (Ref marker: -14dB) +16dBu (Ref marker: -12dB) > 600 $\Omega$ < 50 $\Omega$ Electronic Balance XLR-3-32  AES/EBU (Professional) & Consumer of IEC958 3.07 Mbit/sec (Fs : 48kHz) 250 $\Omega$ Electronic balance 0.25V pk-pk XLR-3-31  AES/EBU (Professional) & Consumer of IEC958 3.07 Mbit/sec (Fs : 48kHz) 110 $\Omega$ Electronic balance 2.5V pk-pk > 60 $\Omega$ XLR-3-32  2V pk-pk 2.4 kbit/sec (SMPTE) 0.25V pk-pk > 20k $\Omega$ Electronic balance XLR-3-31  2V pk-pk 2.4 kbit/sec (SMPTE) > 600 $\Omega$ < 50 $\Omega$ Electronic balance XLR-3-32  > 32 $\Omega$ 80mW / 32 $\Omega$ 6.35mm stereo phone jack
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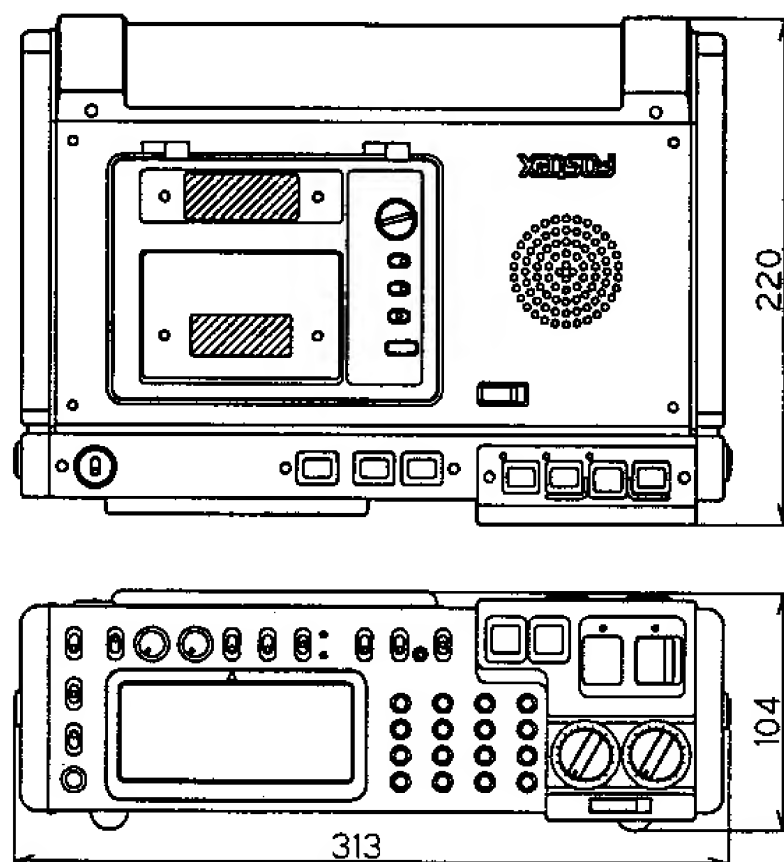
## Electrical

Record/playback frequency response	20Hz - 20kHz $\pm 1.0$ dB
S/N ratio	> 90dB (Emphasis ON)
Dynamic range	> 90dB (Emphasis ON)
THD	< 0.05% / 1kHz, +4dBu out, Emphasis ON
Channel separation	80dB / 1kHz
Pre-emphasis deviation	$\pm 1$ dB / 10kHz
De-emphasis deviation	$\pm 1$ dB / 10kHz
Wow & Flutter	< 0.002% W.PEAK
Mixed modulation distortion ratio	< 0.03% (60Hz & 7kHz)
Channel phase difference	< 20°
Pitch deviation	< 0.005%
Level display	28 segment LCD peak meter
Standard record level	-18, -16, -14, -12 dB
	0dB = 16 bit full scale level
Peak hold time	0.5 sec
MIC Limiter	
Compression ratio	1:3
Attack time	20ms
Release time	200ms
THD	< 0.1% (-10dB / 1kHz)
MIC filter	
" M " position	$f_c=40$ Hz, -12dB/oct
" V1 " position	$f_c=80$ Hz, -12dB/oct
" V2 " position	$f_c=400$ Hz, -6dB/oct
MIC ATT attenuation	-15dB, -30dB $\pm 1$ dB

## External synchronization inputs & outputs

Video sync input	
Minimum input level	1V pk-pk
Input impedance	> 75 $\Omega$
Input frame rate	Composite video signal: 25, 29.97, 30 frame/sec Frame sync signal: 24, 25, 29.97, 30 frame/sec Field sync signal: 48, 50, 59.94, 60 field/sec
Connector	BNC
Word sync input	
Input word sync rate	48kHz, 44.1kHz, 44.056kHz
Minimum input level	> 2 - 5V pk-pk
Input impedance	75 $\Omega$
Connector	BNC
Word sync output/Video sync output	
Word sync output	50% Duty cycle
DAT frame output	50% Duty cycle
Frame pulse output	Minimum pulse width 10ms
Output level	> 2 - 5V pk-pk
Load impedance	75 $\Omega$
Output impedance	< 50 $\Omega$
Connector	BNC

## Dimensional drawings



## 15 Appendix

### Glossary of DAT recording

1.5TP	Track pitch (20.4 $\mu$ m) when recording at 1.5x speed (wide track mode).
8-10 modulation	Modulation format used for all DAT recording. 8-10 modulation offers the following performance: <ol style="list-style-type: none"> <li>1) DC free.</li> <li>2) Spectrum is concentrated as much as possible on the short wave side to maximise azimuth effect.</li> <li>3) The shortest wavelength and the longest wavelength ratio is 1:3-4, so there is no change in the S/N for over-write.</li> </ol>
A/D	Analog to digital signal conversion.
Aliasing noise	Noise generated when the frequency of the signal being digitized exceeds $f_s/2$ .
Analog	Continuously changing over time.
ATF	Auto Track Finding. The Servo tracking system used for DAT.
ATF sync	Timing signal for extracting the ATF pilot.
Azimuth	In DAT recording, the head gap is given a certain slant relative to the track, this helps to reduce the crosstalk between channels.
Azimuth loss	A reduced playback level caused by the angle of the tracks on tape being slightly misaligned.
Bit	The smallest unit of digital data.
Blank search	Searching for an area on tape that has not been recorded (no audio, no sub-code).
Block	1 block = 288 bits (1 track = 196 blocks)
BOT	Beginning Of Tape.
Burst error	An error of a short duration.
C1	Parity check code, data name is P.
C2	Parity check code, data name is Q.
Category code	The channel status bytes present in the AES/EBU interconnect standard. Options are: Professional or Consumer.
Channel bit	A bit of data after being modulated.
Channel frequency	(fch) Maximum frequency of the signal recorded onto tape (4.704MHz).
Crosstalk	The pick-up of unwanted signal from adjacent tape tracks. The ATF system measures the crosstalk from both channels to centre itself in the track.
D/A	Digital to analog signal conversion.
DAT tape	Metal chrome tape, thickness 13 $\mu$ m, width 3.8mm.
Digital	Not continuously changing over time. Data represented in a numerical form.
Dropout	The loss of a continuous signal due to attenuation or noise.
Drum	The head mounting assembly, consisting of the drum motor, rotary transformer, upper drum (revolving), lower drum (fixed) and the mounting flange.

Erase signal	1.5MHz signal that is used to erase the ATF area pilot and sync signal while re-recording.
Error correction	The detection and correction of digital signal errors. Possible causes, dirt or tape scratches.
Error rate	The number of errors detected in relation to the total amount of data.
Frame	1 frame = two tracks, or one drum rotation, 30msec long.
Fs	Sampling frequency
Guard-bandless	Recording with no space between adjacent recording tracks.
Head	The component that performs the electromagnetic conversion mounted inside the upper drum. Track width is 20 $\mu$ m, azimuth angle is 20 degrees, head tip is 2mm x 2mm and the gap mainly consists of sendust.
IBG Inter Block Gap	The space between recorded data blocks.
ID hole	Holes in the DAT cassette used to identify the tape type.
Jitter	Variation of the reference timing signal. Similar to wow and flutter (frequency variation).
Lid	The cover that protects, and provides access to the tape.
Over-write	The recording of a new signal directly on top of the old signal (does not require an erase head).
P	Parity check code (C1).
Pack	The area of the Sub data containing the time and date information.
PCM	(Pulse Code Modulation) Digital audio data represented as binary digits 1 and 0.
Pilot signal	A 130kHz signal recorded on tape that is used by the ATF system.
PNO.	Program number. The number allocated when a START ID is recorded.
Random error	An indiscriminate error, possible cause dirt, or tape scratches.
Quantization error	Noise present in a signal due to inaccuracies in the A/D conversion.
Recording current	The current required by the head to record signals onto tape.
Rotary transformer	The transformer that is used to convey the signal from the upper drum to the lower drum.
Sampling frequency	The number of measurements of the analog signal taken during A/D conversion in one second.
Sub data	Data other than PCM audio, such as program number, index number and timing information, etc.
TOC	Table of contents
Track pitch	Distance between tracks; 13.591 $\mu$ m (normal track mode), 20.41 $\mu$ m (wide track mode).
Tracking servo	Capstan servo system that ensures the tape passes the drum at the required speed.
Wide track mode	(WT) For prerecorded cassettes, play speed is 1.5x faster than normal and the track pitch is 20.4 $\mu$ m.
Word	One sample of audio data represented as 16 bits.
Word clock	Used for synchronizing PCM audio signals. The word clock frequency will be the same as the sampling frequency.
Wrap angle	The head area that is in contact with the tape. For DAT it is 90°.



## DAT and the PD-2

### Four head system

The PD-2's cylinder drum contains four heads, providing off-tape confidence monitoring, Fig 15.1 , page 79.

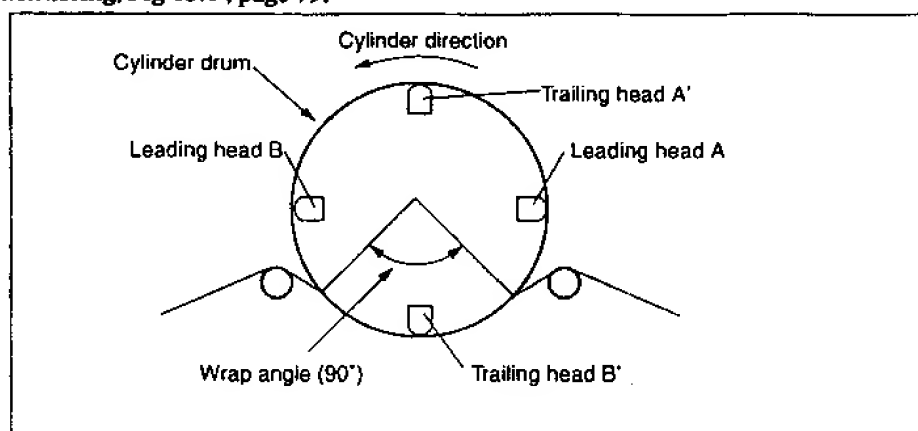


Fig 15.1

The heads are mounted 90 degrees apart inside the rotating half of the drum. Heads that are 180 degrees apart are used as leading, and trailing pairs. So, A and B are the leading heads, A' and B' are the trailing heads. When recording, the leading heads are used to record and the trailing heads are used for playback. The off-tape confidence monitor signal will be delayed by about 200ms, Fig 15.2 , page 79. During playback, only the leading heads are used.

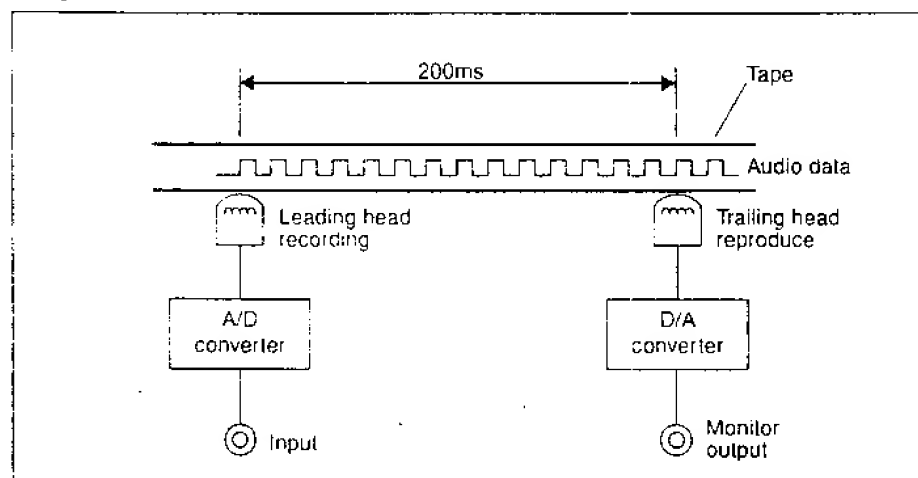


Fig 15.2

### Order of sampling

On some domestic DAT recorders, 2-channel alternate sampling is used, this means that CH1 and CH2 are not sampled at the same time, but alternately. Professional DAT recorders, like the PD-2, use 2-channel simultaneous sampling, CH1 and CH2 sampled at the same time. When a tape that has been recorded using 2-channel alternate sampling is played back in the PD-2, there will be a phase difference of about  $10 \mu s$ .

## Digital audio Interface (IEC 958)

The IEC 958 interface is a serial, self-clocking PCM audio transmission format used for connecting digital audio equipment. The transmission rate is the same as the sampling frequency. The IEC 958 format specifies two types:

- 1) AES/EBU (Broadcasting studio use in the IEC 958 standard)
- 2) Consumer use (SPDIF) in the IEC 958 standard

The difference between the two types, is the data contained in the "channel status bits" of each DAT sub frame. A DAT sub frame containing, sync preamble, one PCM digital audio word, validity flag, user data, channel status and parity bits.

Only the consumer format contain the SCMS copy protection information. The AES/EBU broadcast format carries more information in the channel status bits, and allows a more intelligent interconnection between digital audio equipment.

### Connection

The IEC specifies;

- 1) A balanced cable with a cable impedance of  $110\ \Omega$ , terminated with XLR type connectors.
- 2) An unbalanced cable with a cable impedance of  $75\ \Omega$ , terminated with phono/RCA-jack connectors.

Which should be used for consumer and broadcast, is not actually specified by the IEC, but generally AES/EBU (Broadcasting studio use in the IEC 958 standard) connections are balanced and Consumer use (SPDIF) in the IEC 958 standard are unbalanced. These are specified in the EIAJ (Electronic Industries Association Japan) standard.

## IEC and FOSTEX TC formats

The PD-2 can record and playback using two DAT timecode formats: FOSTEX and IEC. These are briefly explained below.

### FOSTEX format

This format was developed by Fostex and was first used on the Fostex D-20B DAT Recorder.

Timecode is recorded as an 80-bit data stream in the sub-data area. The timecode bit clock is synchronized to the DAT frame clock, so the recorded timecode is perfectly synchronized with the recorded PCM audio.

### IEC format

Timecode is converted into DAT exclusive frame time data "PRO R-time", and recorded in the sub-data area. When played back, any of the standard timecode frame rates can be generated from the PRO R-time information. For example, a tape recorded at 30F or 29.97F can be played back and a frame rate of 25F can be output.

With the IEC format, user bits, flags, etc., are recorded in the same sub-data area "data pack" as the PRO R-time. Due to the delay incurred during the timecode conversion, recording of the user bits, flags, etc., will be delayed by one DAT frame. Because the user bits, flags, etc. are static data, new timecode cannot be recorded. Therefore, if new timecode must be recorded, the FOSTEX format is recommended.

On the PD-2, real time and date information can be recorded as user bits in the sub-data area, see soft function "[61] TC U-bit 'TC Ubit'", on page 63.

## 16 Index

### A

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